Illinois Department of Transportation

To:	John Fortman	Attn: District One
From:	John D. Baranzelli	
Subject:	Pavement Design	
Date:	July 24, 2013	

FAU 3502 (US Route 45)
Lake County
From IL 60 to IL 22

We have reviewed the pavement design for the above captioned section, which was submitted to BDE on June 17, 2013. LCCA favors the rigid pavement design by more than 10%, and does not require alternate bidding. The approved pavement design is as follows:

US 45 at IL 60 [Reconstruction]
US 45 at IL 83 [Reconstruction]

9.75 inches of PCC Jointed Pavement with Tied PCC Curb & Gutter
12 inches Aggregate Subgrade Improvement

US 45 from IL 83 to IL 22 [Reconstruction]
US 45/IL 21 at West Olde Half Day Road [Reconstruction]
US 45/IL 21 at IL 22 [Reconstruction]
US 45/North Olde Half Day Drive at US 45/IL 21 [Reconstruction]
US 45 at Ranney Avenue [Reconstruction]

9 inches of PCC Jointed Pavement with Tied PCC Curb & Gutter
12 inches Aggregate Subgrade Improvement

IL 21 from US 45 to Georgetown Way [Reconstruction]

9.25 inches of PCC Jointed Pavement with Tied PCC Curb & Gutter
12 inches Aggregate Subgrade Improvement

The following pavement designs are subject to local jurisdictional concurrence:

Oakwood Road [Reconstruction]
Evergreen Drive [Reconstruction]
Deerpath Drive [Reconstruction]
Marriot Drive [Reconstruction]

7.75 inches of PCC Jointed Pavement with Tied PCC Curb & Gutter
12 inches Aggregate Subgrade Improvement

Fairway Drive/Buffalo Grove Road [Reconstruction]
Butterfield Road [Reconstruction]

8.5 inches of PCC Jointed Pavement with Tied PCC Curb & Gutter
12 inches Aggregate Subgrade Improvement

Jamestown Lane/Port Clinton Road [Reconstruction]
Jewel Osco Entrance [Reconstruction]

9.25 inches of PCC Jointed Pavement with Tied PCC Curb & Gutter
12 inches Aggregate Subgrade Improvement

If you have any questions, please contact Paul Niedernhofer at (217) 524-1651.

Illinois Department of Transportation

Memorandum

To:	John D. Baranzelli	Attn:	Paul Niedernhofer
From:	John Fortmann	By:	M. Mangoba/J. Dominguez
Subject:	Pavement Analysis		
Date:	June 17, 2013		

Route: FAU 3502 (US 45)
Limits: from IL60 to IL22
Section: 49-Y
County: Lake

Contract No.: 60N84
Job No.: D-91-408-11
Current target: 06CY14

We have completed the pavement analysis for the above captioned location. Review by the Central Office is required since the total pavement area for reconstruction exceeds 4,750 Square Yards. The following is the scope of the project:

a) Pavement reconstruction on US 45 at IL 60
b) Pavement reconstruction on US 45 at IL 83
c) Pavement reconstruction on US 45 from IL 83 to IL 22
d) Pavement reconstruction on US 45/IL 21 at West Olde Half Day Road
e) Pavement reconstruction on US 45/IL 21 at IL 22
f) Pavement reconstruction on US 45/North Olde Half Day Dr at US45/IL 21
g) Pavement reconstruction on US 45 at Ranney ave
h) Pavement reconstruction on Oakwood Rd
i) Pavement reconstruction on Evergreen Dr
j) Pavement reconstruction on Deerpath Dr
k) Pavement reconstruction on at Marriott Drive
l) Pavement reconstruction on Fairway Dr/ Buffalo Grove Rd
m) Pavement reconstruction on Butterfield Rd
n) Pavement reconstruction on Jamestown lane /Port Clinton
o) Pavement reconstruction on Jewel Osco Entrance
p) Pavement reconstruction on IL 21 from US 45 to Georgetown Way

A 20-year pavement analysis was performed on the segments below. We recommend a mechanistic-rigid pavement design on the segments below based on the life cycle cost analysis which favors Portland Cement Concrete pavement by 23%. Recommendations for each segment are as follows based on the mechanistic pavement design procedure using life cycle cost analysis.

a) US 45 at IL 60
b) US 45 at IL 83
PCC curb and gutter (tied)
Reconstruction
9 ¾" Portland Cement Concrete [1]
12" Agregate Subgrade Improvement [2]

A 20-year pavement analysis was performed on the segments below. We recommend a mechanistic-rigid pavement design on the segments below based on the life cycle cost analysis which favors Portland Cement Concrete pavement by 40.7%. Recommendations for each segment are as follows based on the mechanistic pavement design procedure using life cycle cost analysis.

c) US 45 from IL 83 to IL 22
d) US 45/IL 21 at West Olde Half Day Road
e) US 45/IL 21 at IL 22
f) US 45/North Olde Half Day Dr at US45/IL 21 [3]
g) US 45 at Ranney ave
PCC curb and gutter (tied)
Reconstruction
9" Portland Cement Concrete [4]
12" Agregate Subgrade Improvement [2]

A 20-year pavement analysis was performed on the segments below. The life cycle cost analysis does not favor either pavement by more than 10%. However, since the scope of work of the project is "less than 2 lane-miles in length" an alternate bid does not need to be considered according to section 1.04-1a of Chapter 54 of the BDE manual. Thus, a mechanistic-rigid pavement design is recommended since the life cycle cost analysis does favor PCC. The recommended pavement is:

h) Oakwood Rd [3]
i) Evergreen Dr [3]
j) Deerpath Dr [3]
k) Marriott Drive
PCC curb and gutter (tied)
Reconstruction
7 ¾" Portland Cement Concrete [5]
12" Agregate Subgrade Improvement [2]

A 20-year pavement analysis was performed on the segments below. The life cycle cost analysis does not favor either pavement by more than 10%. However, since the scope of work of the project is "less than 2 lane-miles in length" an alternate bid does not need to be considered according to section 1.04-1a of Chapter 54 of the BDE manual. Thus, a mechanistic-rigid pavement design is recommended since the life cycle cost analysis does favor PCC. The recommended pavement is:

l) Fairway Dr/ Buffalo Grove Rd [3]
m) Butterfield Rd [3]
PCC curb and gutter (tied)
Reconstruction
8 ½" Portland Cement Concrete [6]
12" Agregate Subgrade Improvement [2]

A 20-year pavement analysis was performed on the segments below. The life cycle cost analysis does not favor either pavement by more than 10%. However, since the scope of work of the project is "less than 2 lane-miles in length" an alternate bid does not need to be considered according to section 1.04-1a of Chapter 54 of the BDE manual. Thus, a mechanistic-rigid pavement design is recommended since the life cycle cost analysis does favor PCC. The recommended pavement is:

n) Jamestown lane /Port Clinton [3]
o) Jewel Osco Entrance
p) IL 21 from US 45 to Georgetown Way
PCC curb and gutter (tied)
Reconstruction
9 ¼" Portland Cement Concrete [7]
12" Agregate Subgrade Improvement [2]

[1] Designer Note 1: Use pay item **#42000416, "PORTLAND CEMENT CONCRETE PAVEMENT 9 ¾" (JOINTED)"** paid for in square yards.

[2] Designer Note 2: Use pay item **#30300112, "AGGREGATE SUBGRADE IMPROVEMENT 12" "** paid for in square yards.

[3] Designer Note 3: Oakwood Road, Butterfield Road, Evergreen Drive, Deerpath Drive, Ranney Avenue, Fairway Dr/Buffalo Grove rd, Jamestown Lane/Port Clinton Road, Olde half day Road and Marriott Drive and Georgetown way are subject to local jurisdictional approval and concurrence.

[4] Designer Note 1: Use pay item **#42000401, "PORTLAND CEMENT CONCRETE PAVEMENT 9" (JOINTED)"** paid for in square yards.

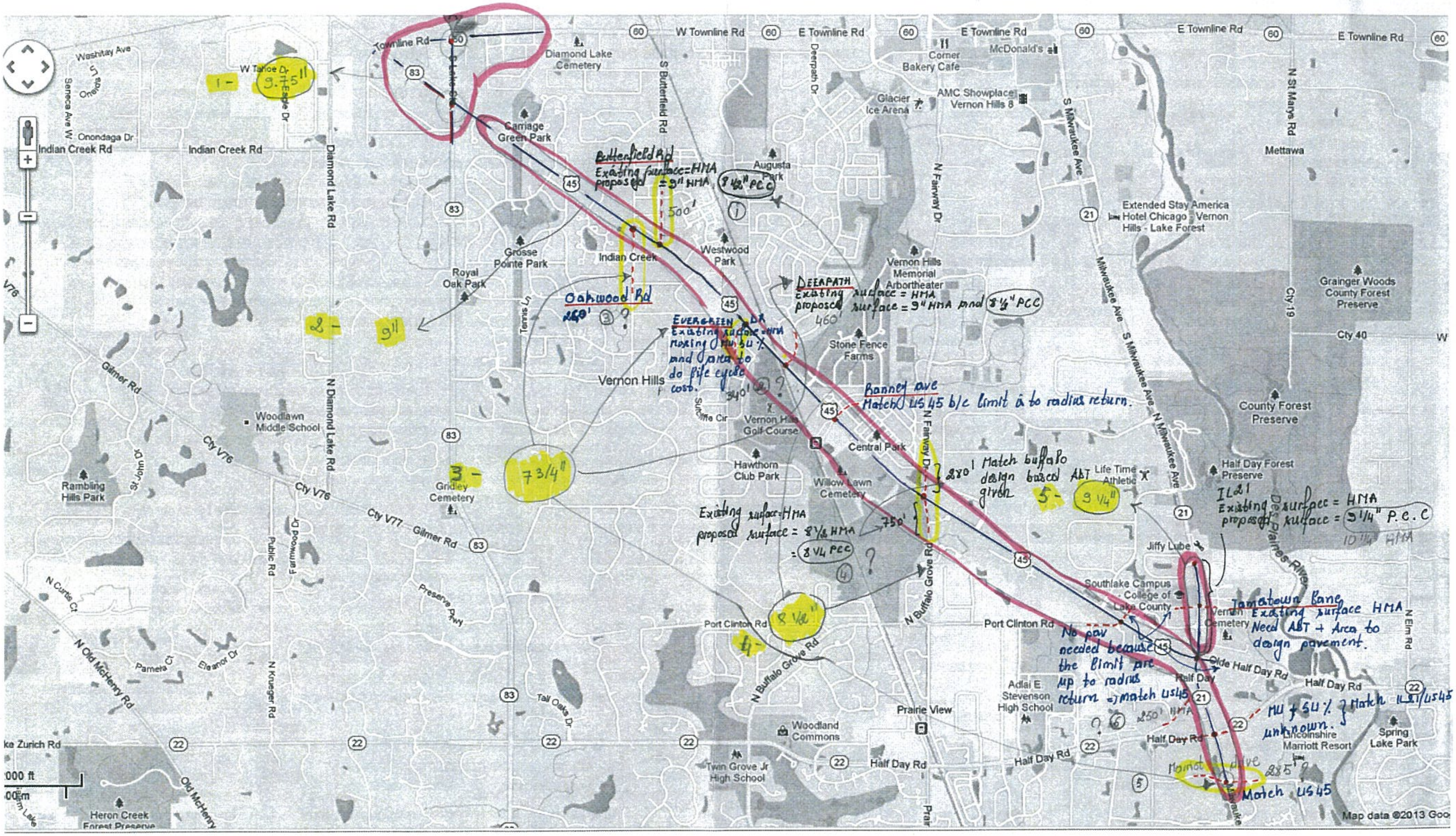
[5] Designer Note 5: Use pay item **#42000216, "PORTLAND CEMENT CONCRETE PAVEMENT 7 ¾" (JOINTED)"** paid for in square yards.

[6] Designer Note 6: Use pay item **#42000311, "PORTLAND CEMENT CONCRETE PAVEMENT 8 ½" (JOINTED)"** paid for in square yards.

[7] Designer Note 7: Use pay item **#42000411, "PORTLAND CEMENT CONCRETE PAVEMENT 9 ¼" (JOINTED)"** paid for in square yards.

If you have any questions or need additional information, please contact Jenpai Chang, Interim Pavement Engineer, at (847) 705-4432.

By: José A. Dominguez
Jose A. Dominguez, P.E.
Project Support Engineer



Butterfield Rd
Existing surface = HMA
proposed = 9" HMA
9 1/2" PCC
500'
Oakwood Rd
Evergreen Dr
Deerpath
Existing surface = HMA
proposed surface = 9" HMA and 8 1/4" PCC
460'
Banney ave
Match US 45 b/c limit is to radius return.
280' Match buffalo design based ABT given
Existing surface = HMA
proposed surface = 8 1/4 HMA
= 8 1/4 PCC
750'
IL 21
Existing surface = HMA
proposed surface = 9 1/4" P.C.C
10 1/4 HMA
Jamestown Lane
Existing surface HMA
Need ABT + Area to design pavement.
No pav needed because the limit are up to radius return => match US45
Match US 45
1 - 9.75"
2 - 9"
3 - 7 3/4"
4 - 8 1/4"
5 - 9 1/4"
Map data ©2013 Google

BDE 5401 Template (Rev. 10/05/2012)

IDOT MECHANISTIC PAVEMENT DESIGN

Printed: 11/07/2013

PROJECT AND TRAFFIC INPUTS

(Enter Data in Gray Shaded Cells)

Route:	US 45	Comments:			
Section:	49- Y				
County:	Lake	Design Date:	05/14/2013	<-- BY	
Location:	IL 60 T0 IL 22	Modify Date:	02/14/2013	<-- BY	

	ADT	Year
Current:	22,600	2002
Future:	27,000	2030

Facility Type: Other Marked State Route

# of Lanes = 4

Road Class: I

Subgrade Support Rating (SSR): Poor

Construction Year: 2013

Design Period (DP) = 20 years

	Minimum ADT	Structural Design Traffic: Actual ADT	Actual %of Total ADT	% of ADT in Design Lane	
PV =	0	24,659	95.2%	P =	32%
SU =	250	730	2.8%	S =	45%
MU =	750	510	2.0%	M =	45%
Struct. Design ADT =		25,900	(2023)		

TRAFFIC FACTOR CALCULATION

FLEXIBLE PAVEMENT			RIGID PAVEMENT		
Cpv =	0.15		Cpv =	0.15	
Csu =	132.5		Csu =	143.81	
Cmu =	482.53		Cmu =	696.42	
TF flexible (Actual) =	3.11	(Actual ADT)	TF rigid (Actual) =	4.17	(Actual ADT)
TF flexible (Min) =	3.56	(Min ADT Fig. 54-2.C)	TF rigid (Min) =	5.02	(Min ADT Fig. 54-2.C)

NEW CONSTRUCTION / RECONSTRUCTION PAVEMENT DESIGN CALCULATIONS

Full-Depth HMA Pavement

Use TF flexible = 3.56

PG Grade Lower Binder Lifts = PG 64-22 (Fig. 53-4.R)

Goto Map

HMA Mixture Temp. = 73.0 deg. F (Fig. 54-5.C)

Design HMA Mixture Modulus (E_{HMA}) = 760 ksi (Fig. 54-5.D)

Design HMA Strain (ε_{HMA}) = 84 (Fig. 54-5.E)

Goto Map

Full Depth HMA Design Thickness = 9.75 in. (Fig. 54-5.F)

Limiting Strain Criterion Thickness = 14.25 in. (Fig. 54-5.I)

Use Full-Depth HMA Thickness = 9.75 inches

JPC Pavement

Use TF rigid = 5.02

Edge Support = Tied Shoulder or C.&G.

Rigid Pavt Thick. = 9.00 in. (Fig. 54-4.E)

CRC Pavement

Use TF rigid = 5.02

IBR value = 2

CRCP Thickness = 8.25 in. (Fig. 54-4.M)

TF MUST BE > 60 FOR CRCP

RECONSTRUCTION ONLY (SUPPLEMENTAL) PAVEMENT DESIGN CALCULATIONS

HMA Overlay of Rubblized PCC

Use TF flexible = 3.56

District = 3,4,5,6

HMA Overlay Design Thickness = 8.00 in. (Fig. 54-5.U)

Unbonded Concrete Overlay

Review 54-4.03 for limitations and special considerations.

JPCP Thickness = NA inches

CONTACT BMPR FOR ASSISTANCE

DESIGN TABLES FROM BDE MANUAL CHAPTER 54 - PAVEMENT DESIGN

Class I Roads	Class II Roads	Class III Roads	Class IV Roads
4 lanes or more Part of a future 4 lanes or more One-way Streets with ADT > 3500	2 lanes with ADT > 2000 One way Street with ADT <= 3500	2 Lanes (ADT 750 -2000)	2 Lanes (ADT < 750)

	Min. Str. Design Traffic (Fig 54-2.C)		
Facility Type	PV	SU	MU
Interstate or Supplemental Freeway	0	500	1500
Other Marked State Route	0	250	750
Unmarked State Route	No Min	No Min	No Min

Class Table for One-Way Streets	
ADT	Class
0 - 3500	II
>3501	I

	Traffic Factor ESAL Coefficients			
	Rigid (Fig. 54-4.C)		Flexible (Fig. 54-5.B)	
Class	Csu	Cmu	Csu	Cmu
I	143.81	696.42	132.50	482.53
II	135.78	567.21	112.06	385.44
III	129.58	562.47	109.14	384.35
IV	129.58	562.47	109.14	384.35

Class Table for 2 or 3 lanes (not future 4 lane & not one-way street)	
ADT	Class
0 - 749	IV
750 - 2000	III
>2000	II

	Design Lane Distribution Factors For Structural Design Traffic (Fig. 54-2.B)					
	Rural			Urban		
Number of Lanes	P	S	M	P	S	M
1 Lane Ramp	100%	100%	100%	100%	100%	100%
2 or 3	50%	50%	50%	50%	50%	50%
4	32%	45%	45%	32%	45%	45%
6 or more	20%	40%	40%	8%	37%	37%

BDE 5401 Template (Rev. 10/05/2012) Printed: 11/07/2013

LIFE-CYCLE COST ANALYSIS: NEW CONSTRUCTION / RECONSTRUCTION

FULL-DEPTH HMA PAVEMENT

Standard Design

ROUTE			US 45		
SECTION			49- Y		
COUNTY			Lake		
LOCATION			IL 60 T0 IL 22		
FACILITY TYPE			INTERSTATE		
PROJECT LENGTH			21120 FT	= = >	4.00 Miles
# OF CENTERLINES			1 CL		
# OF LANES			4 LANES		
# OF EDGES			2 EP		
LANE WIDTH - AVERAGE			12 FT		
SHOULDER WIDTH	HMA	Inside	0 FT		
	HMA	Outside	0 FT		
PAVEMENT THICKNESS (FLEXIBLE)			11.00 IN		14.25 IN MAX
SHOULDER THICKNESS			8.00 IN		HMA SH Standard Design
POLICY OVERLAY THICKNESS			3.75 IN		

FLEX PAVEMENT TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
	7.11	3.11	7.11

Read Me!

HMA COST PER TON	UNIT PRICE
HMA SURFACE	$95.00 / TON
HMA TOP BINDER	$90.00 / TON
HMA LOWER BINDER	$85.00 / TON
HMA BINDER (LEVELING)	$95.00 / TON
HMA SHOULDER	$85.00 / TON

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT		UNIT PRICE	COST
HMA PAVEMENT (FULL-DEPTH)	(11.00")	112,640	SQ YD		$55.12 / SQ YD	$6,208,791 ~
HMA SURFACE COURSE	(2.00")	112,640	SQ YD	*	$9.94 / SQ YD	$0
HMA TOP BINDER COURSE	(2.25")	112,640	SQ YD	*	$9.81 / SQ YD	$0
HMA LOWER BINDER COURSE	(6.75")	112,640	SQ YD	*	$24.39 / SQ YD	$0
HMA SHOULDER	(8.00")	0	SQ YD	*	$41.73 / SQ YD	$0 ~
CURB & GUTTER		0	LIN FT		$30.00 / LIN FT	$0
SUBBASE GRAN MATL TY C (TONS)		352	TONS		$25.00 / TON	$8,800
IMPROVED SUBGRADE:	Aggregate	5,333	SQ YD	*	$10.00 / SQ YD	$53,330
Reserved For User Supplied Item		0	UNITS		$0.00 / UNITS	$0
Reserved For User Supplied Item		0	UNITS		$0.00 / UNITS	$0
PAVEMENT REMOVAL		112,640	SQ YD		$0.00 / SQ YD	$0
SHOULDER REMOVAL		0	SQ YD		$0.00 / SQ YD	$0

Note: * Denotes User Supplied Quantity

FLEXIBLE CONSTRUCTION INITIAL COST	$6,270,921
FLEXIBLE CONSTRUCTION ANNUAL COST PER MILE	$63,940

MAINTENANCE COSTS:

ITEM		THICKNESS	MATERIAL	UNIT COST
ROUTINE MAINTENANCE ACTIVITY				$0.00 LANE-MILE / YEAR
HMA OVERLAY PVMT SURF		(2.00")	Surface Mix	$9.94 / SQ YD
HMA OVERLAY PVMT		(3.75")		$18.64 / SQ YD
HMA SURFACE MIX		(1.50")	Surface Mix	$8.70 / SQ YD
HMA BINDER MIX		(2.25")	Top Binder Mix	$9.94 / SQ YD
HMA OVERLAY SHLD	(Year 30)	(1.75")	Shoulder Mix	$8.70 / SQ YD
HMA OVERLAY SHLD		(2.00")	Shoulder Mix	$9.94 / SQ YD
MILLING (2.00 IN)				$2.50 / SQ YD
PARTIAL DEPTH PVMT PATCH		(Mill & Fill Surf)	Surface Mix	$90.83 / SQ YD
PARTIAL DEPTH SHLD PATCH		(Mill & Fill Surf)	Shoulder Mix	$89.71 / SQ YD
PARTIAL DEPTH PVMT PATCH		(Mill & Fill +2.00 ")	Leveling Binder Mix	$90.83 / SQ YD
PARTIAL DEPTH SHLD PATCH		(Mill & Fill +2.00 ")	Shoulder Mix	$89.71 / SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL				$2.00 / LIN FT
CENTERLINE JOINT ROUT & SEAL				$2.00 / LIN FT
RANDOM / THERMAL CRACK ROUT & SEAL		(100% Rehab = 110.00' / Station / Lane)		$2.00 / LIN FT

FLEXIBLE TOTAL LIFE-CYCLE COST	$9,122,347
FLEXIBLE TOTAL ANNUAL COST PER MILE	$93,014

HMA_SD

MAINTENANCE AND REHABILITATION ACTIVITY SCHEDULE 11/07/13

FULL-DEPTH HMA PAVEMENT
HMA OVERLAY OF RUBBLIZED PCC PAVEMENT
Figure 54-7.C
STANDARD DESIGN

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST		COST	PRESENT WORTH
YEAR 5								
	LONG SHLD JT R&S	100.00%	42,240	LIN FT	$2.00		$84,480	
	CNTR LINE JOINT R&S	100.00%	21,120	LIN FT	$2.00		$42,240	
	RNDM / THRM CRACK R&S	50.00%	46,464	LIN FT	$2.00		$92,928	
	PD PVMT PATCH M&F SURF	0.10%	113	SQ YD	$90.83		$10,264	
	PWFn =	0.8626		PW =	0.8626	X	$229,912	$198,324
YEAR 10								
	LONG SHLD JT R&S	100.00%	42,240	LIN FT	$2.00		$84,480	
	CNTR LINE JOINT R&S	100.00%	21,120	LIN FT	$2.00		$42,240	
	RNDM / THRM CRACK R&S	50.00%	46,464	LIN FT	$2.00		$92,928	
	PD PVMT PATCH M&F SURF	0.50%	563	SQ YD	$90.83		$51,137	
	PWFn =	0.7441		PW =	0.7441	X	$270,785	$201,489
YEAR 15								
	MILL PVMT & SHLD 2.00"	100.00%	112,640	SQ YD	$2.50		$281,600	
	PD PVMT PATCH M&F ADD'L 2.00"	1.00%	1,126	SQ YD	$90.83		$102,275	
	HMA OVERLAY PVMT 2.00"	100.00%	112,640	SQ YD	$9.94		$1,119,642	
	HMA OVERLAY SHLD 2.00 "	100.00%	0	SQ YD	$9.94		$0	
	PWFn =	0.6419		PW =	0.6419	X	$1,503,517	$965,050
YEAR 20								
	LONG SHLD JT R&S	100.00%	42,240	LIN FT	$2.00		$84,480	
	CNTR LINE JOINT R&S	100.00%	21,120	LIN FT	$2.00		$42,240	
	RNDM / THRM CRACK R&S	50.00%	46,464	LIN FT	$2.00		$92,928	
	PD PVMT PATCH M&F SURF	0.10%	113	SQ YD	$90.83		$10,264	
	PWFn =	0.5537		PW =	0.5537	X	$229,912	$127,297
YEAR 25								
	LONG SHLD JT R&S	100.00%	42,240	LIN FT	$2.00		$84,480	
	CNTR LINE JOINT R&S	100.00%	21,120	LIN FT	$2.00		$42,240	
	RNDM / THRM CRACK R&S	50.00%	46,464	LIN FT	$2.00		$92,928	
	PD PVMT PATCH M&F SURF	0.50%	563	SQ YD	$90.83		$51,137	
	PWFn =	0.4776		PW =	0.4776	X	$270,785	$129,328
YEAR 30	INTERSTATE							
	MILL PVMT ONLY 2.00"	100.00%	112,640	SQ YD	$2.50		$281,600	
	PD PVMT PATCH M&F ADD'L 2.00"	2.00%	2,253	SQ YD	$90.83		$204,640	
	PD SHLD PATCH M&F SURF 2.00"	1.00%	0	SQ YD	$89.71		$0	
	HMA OVERLAY PVMT 3.75 "	100.00%	112,640	SQ YD	$18.64		$2,099,328	
	HMA OVERLAY SHLD 1.75 "	100.00%	0	SQ YD	$8.70		$0	
	PWFn =	0.4120		PW =	0.4120	X	$2,585,568	$1,065,220
YEAR 35								
	LONG SHLD JT R&S	100.00%	42,240	LIN FT	$2.00		$84,480	
	CNTR LINE JOINT R&S	100.00%	21,120	LIN FT	$2.00		$42,240	
	RNDM / THRM CRACK R&S	50.00%	46,464	LIN FT	$2.00		$92,928	
	PD PVMT PATCH M&F SURF	0.10%	113	SQ YD	$90.83		$10,264	
	PWFn =	0.3554		PW =	0.3554	X	$229,912	$81,707
YEAR 40								
	LONG SHLD JT R&S	100.00%	42,240	LIN FT	$2.00		$84,480	
	CNTR LINE JOINT R&S	100.00%	21,120	LIN FT	$2.00		$42,240	
	RNDM / THRM CRACK R&S	50.00%	46,464	LIN FT	$2.00		$92,928	
	PD PVMT PATCH M&F SURF	0.50%	563	SQ YD	$90.83		$51,137	
	PWFn =	0.3066		PW =	0.3066	X	$270,785	$83,011
								$2,851,426
	ROUTINE MAINTENANCE ACTIVITY		16.00	Lane Miles	0.00		$0	$0
					MAINTENANCE LIFE-CYCLE COST			$2,851,426
45	YEAR LIFE CYCLE	CRFn = 0.0407852			MAINTENANCE ANNUAL COST PER MILE			$29,074

PCC PAVEMENT

JPCP

ROUTE			US 45		
SECTION			49- Y		
COUNTY			Lake		
LOCATION			IL 60 T0 IL 22		
FACILITY TYPE			INTERSTATE		
PROJECT LENGTH			21120 FT	= = >	4.00 Miles
# OF CENTERLINES			1 CL		
# OF LANES			4 LANES		
# OF EDGES			2 EP		
LANE WIDTH - AVERAGE			12 FT		
SHOULDER WIDTH	PCC	Inside	0 FT		
	PCC	Outside	0 FT		

PAVEMENT THICKNESS (RIGID)	JPCP	10.00 IN	TIED SHLD
SHOULDER THICKNESS		10.00 IN	
POLICY OVERLAY THICKNESS		3.75 IN	

RIGID PAVEMENT TRAFFIC FACTORS		MINIMUM	ACTUAL	USE
		10.05	4.17	10.05
Worksheet Construction Type is	New Construction		The Pavement Type is	JPCP

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT		UNIT PRICE		COST
JPC PAVEMENT	(10.00")	112,640	SQ YD		$41.00	/ SQ YD	$4,618,240
PAVEMENT REINFORCEMENT		0	SQ YD		$0.00	/ SQ YD	$0
STABILIZED SUBBASE	(4.50")	119,680	SQ YD		$0.00	/ SQ YD	$0
PCC SHOULDERS	(10.00" to 10.00")	0	SQ YD		$36.00	/ SQ YD	$0
CURB & GUTTER		0	LIN FT		$30.00	/ LIN FT	$0
SUBBASE GRAN MATL TY C	(0.00")	352	TONS	*	$25.00	/ TON	$8,800
IMPROVED SUBGRADE:	Aggregate Width = 2.5'	5,333	SQ YD	*	$10.00	/ SQ YD	$53,330
Reserved For User Supplied Item		0	UNITS		$0.00	/ UNITS	$0
Reserved For User Supplied Item		0	UNITS		$0.00	/ UNITS	$0
PAVEMENT REMOVAL		112,640	SQ YD		$0.00	/ SQ YD	$0
SHOULDER REMOVAL		0	SQ YD		$0.00	/ SQ YD	$0

Note: * Denotes User Supplied Quantity

RIGID CONSTRUCTION INITIAL COST	$4,680,370
RIGID CONSTRUCTION ANNUAL COST PER MILE	$47,722

MAINTENANCE COSTS:

ITEM	THICKNESS	MATERIAL	T	UNIT COST	
ROUTINE MAINTENANCE ACTIVITY				$0.00	/ LANE-MILE / YEAR
HMA POLICY OVERLAY	(3.75")		3.75		
HMA POLICY OVERLAY PVMT	(3.75")		3.75	$18.64	/ SQ YD
HMA SURFACE MIX	(1.50")	Surface Mix	1.50	$7.46	/ SQ YD
HMA BINDER MIX	(2.25")	Top Binder Mix	2.25	$11.18	/ SQ YD
HMA POLICY OVERLAY SHLD	(3.75")	Shoulder Mix	3.75	$18.64	/ SQ YD
CLASS A PAVEMENT PATCHING				$170.00	/ SQ YD
CLASS B PAVEMENT PATCHING				$130.00	/ SQ YD
CLASS C SHOULDER PATCHING				$110.00	/ SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA Surf)		Surface Mix	1.50	$88.17	/ SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA 1.50")		Surface Mix	1.50	$88.17	/ SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL				$2.00	/ LIN FT
CENTERLINE JOINT ROUT & SEAL				$2.00	/ LIN FT
REFLECTIVE TRANSVERSE CRACK ROUT & SEAL				$2.00	/ LIN FT
RANDOM CRACK ROUT & SEAL	(100% Rehab = 100.00' / Station / Lane)			$2.00	/ LIN FT

RIGID TOTAL LIFE-CYCLE COST	$6,483,504
RIGID TOTAL ANNUAL COST PER MILE	$66,108

MAINTENANCE AND REHABILITATION ACTIVITY SCHEDULE 11/07/13

JOINTED PLAIN CONCRETE PAVEMENT
UNBONDED JOINTED PLAIN CONCRETE OVERLAY
Figure 54-7.A

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST		COST	PRESENT WORTH
YEAR 10								
	PAVEMENT PATCH CLASS B	0.10%	113	SQ YD	$130.00		$14,690	
	PWFn =	0.7441		PW =	0.7441	X	$14,690	$10,931
YEAR 15								
	PAVEMENT PATCH CLASS B	0.20%	225	SQ YD	$130.00		$29,250	
	PWFn =	0.6419		PW =	0.6419	X	$29,250	$18,774
YEAR 20								
	PAVEMENT PATCH CLASS B	2.00%	2,253	SQ YD	$130.00		$292,890	
	SHOULDER PATCH CLASS C	0.50%	0	SQ YD	$110.00		$0	
	LONGITUDINAL SHLD JT R&S	100.00%	42,240	LIN FT	$2.00		$84,480	
	CENTERLINE JT R&S	100.00%	21,120	LIN FT	$2.00		$42,240	
	PWFn =	0.5537		PW =	0.5537	X	$419,610	$232,328
YEAR 25								
	PAVEMENT PATCH CLASS B	3.00%	3,379	SQ YD	$130.00		$439,270	
	SHOULDER PATCH CLASS C	1.00%	0	SQ YD	$110.00		$0	
	PWFn =	0.4776		PW =	0.4776	X	$439,270	$209,798
YEAR 30	INTERSTATE							
	PAVEMENT PATCH CLASS B	4.00%	4,506	SQ YD	$130.00		$585,780	
	SHOULDER PATCH CLASS C	1.50%	0	SQ YD	$110.00		$0	
	HMA POLICY OVERLAY 3.75" (PVMT)	100.00%	112,640	SQ YD	$18.64		$2,099,328	
	HMA POLICY OVERLAY 3.75" (SHLD)	100.00%	0	SQ YD	$18.64		$0	
	PWFn =	0.4120		PW =	0.4120	X	$2,685,108	$1,106,229
YEAR 35	INTERSTATE							
	LONGITUDINAL SHLD JT R&S	100.00%	42,240	LIN FT	$2.00		$84,480	
	CENTERLINE JT R&S	100.00%	21,120	LIN FT	$2.00		$42,240	
	RANDOM CRACK R&S	50.00%	42,240	LIN FT	$2.00		$84,480	
	REFLECTIVE TRANSVERSE CRACK R&S	40.00%	27,034	LIN FT	$2.00		$54,068	
	PD PVMT PATCH M&F HMA SURF 1.50"	0.10%	113	SQ YD	$88.17		$9,963	
	PWFn =	0.3554		PW =	0.3554	X	$275,231	$97,813
YEAR 40	INTERSTATE							
	PAVEMENT PATCH CLASS B	0.50%	563	SQ YD	$130.00		$73,190	
	LONGITUDINAL SHLD JT R&S	100.00%	42,240	LIN FT	$2.00		$84,480	
	CENTERLINE JT R&S	100.00%	21,120	LIN FT	$2.00		$42,240	
	REFLECTIVE TRANSVERSE CRACK R&S	60.00%	40,550	LIN FT	$2.00		$81,100	
	RANDOM CRACK R&S	50.00%	42,240	LIN FT	$2.00		$84,480	
	PD PVMT PATCH M&F HMA SURF 1.50"	0.50%	563	SQ YD	$88.17		$49,640	
	PWFn =	0.3066		PW =	0.3066	X	$415,130	$127,261
								$1,803,134
	ROUTINE MAINTENANCE ACTIVITY		16.00	Lane Miles	$0.00		$0	$0
					MAINTENANCE LIFE-CYCLE COST			$1,803,134
45	YEAR LIFE CYCLE	CRFn = 0.0407852			MAINTENANCE ANNUAL COST PER MILE			$18,385

LIFE-CYCLE COST ANALYSIS: NEW DESIGN

Calculated / Revised : **5/21/13 11:18 AM**

			JPCP	HMA
CONSTRUCTION	INITIAL COST	PRESENT WORTH	$4,680,370	$6,270,921
		ANNUAL COST PER MILE	$47,722	$63,940
MAINTENANCE	LIFE-CYCLE COST	PRESENT WORTH	$1,803,134	$2,851,426
		ANNUAL COST PER MILE	$18,385	$29,074
TOTAL	LIFE-CYCLE COST	PRESENT WORTH	$6,483,504	$9,122,347
		ANNUAL COST PER MILE	$66,108	$93,014

LIFE-CYCLE COST ANALYSIS: FINAL SUMMARY

LOWEST COST OPTION	==========>	**JPCP**	**$66,108**	
OTHER OPTIONS (LOWEST TO HIGHEST):	TYPE / PERCENTAGE	**HMA**	**$93,014**	**40.7%**

P:\Pavement Design Stuff\D-1\US 45 from IL 60 to IL 22 06-18-13\1- US 45 from IL 60 to IL 22\[IDOT Mechanistic Pavement Design US 45 from IL 60 to IL 22.xlsm

BDE 5401 Template (Rev. 10/05/2012)

IDOT MECHANISTIC PAVEMENT DESIGN

Printed: 11/07/2013

PROJECT AND TRAFFIC INPUTS

(Enter Data in Gray Shaded Cells)

Route: IL 60
Section: 49-Y
County: Lake
Location: US 45

Comments:

Design Date: 05/10/2013 CI <-- BY
Modify Date: <-- BY

	ADT	Year
Current:	38,081	2002
Future:	53,000	2030

Facility Type: Other Marked State Route
# of Lanes = 4
Road Class: I
Subgrade Support Rating (SSR): Poor
Construction Year: 2013
Design Period (DP) = 20 years

	Minimum ADT	Structural Design Traffic: Actual ADT	Actual %of Total ADT	% of ADT in Design Lane
PV =	0	47,102	95.6%	P = 32%
SU =	250	1,045	2.1%	S = 45%
MU =	750	1,123	2.3%	M = 45%
Struct. Design ADT =		49,270	(2023)	

TRAFFIC FACTOR CALCULATION

FLEXIBLE PAVEMENT			RIGID PAVEMENT		
Cpv =	0.15		Cpv =	0.15	
Csu =	132.5		Csu =	143.81	
Cmu =	482.53		Cmu =	696.42	
TF flexible (Actual) =	6.17	(Actual ADT)	TF rigid (Actual) =	8.44	(Actual ADT)
TF flexible (Min) =	3.56	(Min ADT Fig. 54-2.C)	TF rigid (Min) =	5.02	(Min ADT Fig. 54-2.C)

NEW CONSTRUCTION / RECONSTRUCTION PAVEMENT DESIGN CALCULATIONS

Full-Depth HMA Pavement

Use TF flexible = 6.17
PG Grade Lower Binder Lifts = PG 64-22 (Fig. 53-4.R)
Goto Map
HMA Mixture Temp. = 74.5 deg. F (Fig. 54-5.C)
Design HMA Mixture Modulus (E_{HMA}) = 710 ksi (Fig. 54-5.D)
Design HMA Strain (ε_{HMA}) = 72 (Fig. 54-5.E)
Goto Map
Full Depth HMA Design Thickness = 11.00 in. (Fig. 54-5.F)
Limiting Strain Criterion Thickness = 14.75 in. (Fig. 54-5.I)

Use Full-Depth HMA Thickness = 11.00 inches

JPC Pavement

Use TF rigid = 8.44
Edge Support = Tied Shoulder or C.&G.

Rigid Pavt Thick. = 9.75 in. (Fig. 54-4.E)

CRC Pavement

Use TF rigid = 8.44
IBR value = 2

CRCP Thickness = 8.75 in. (Fig. 54-4.M)

TF MUST BE > 60 FOR CRCP

RECONSTRUCTION ONLY (SUPPLEMENTAL) PAVEMENT DESIGN CALCULATIONS

HMA Overlay of Rubblized PCC

Use TF flexible = 6.17
District = 3,4,5,6

HMA Overlay Design Thickness = 9.25 in. (Fig. 54-5.U)

Unbonded Concrete Overlay

Review 54-4.03 for limitations and special considerations.

JPCP Thickness = NA inches

CONTACT BMPR FOR ASSISTANCE

DESIGN TABLES FROM BDE MANUAL CHAPTER 54 - PAVEMENT DESIGN

Class I Roads	Class II Roads	Class III Roads	Class IV Roads
4 lanes or more Part of a future 4 lanes or more One-way Streets with ADT > 3500	2 lanes with ADT > 2000 One way Street with ADT <= 3500	2 Lanes (ADT 750 -2000)	2 Lanes (ADT < 750)

Facility Type	Min. Str. Design Traffic (Fig 54-2.C) PV	SU	MU
Interstate or Supplemental Freeway	0	500	1500
Other Marked State Route	0	250	750
Unmarked State Route	No Min	No Min	No Min

Class Table for One-Way Streets	
ADT	Class
0 - 3500	II
>3501	I

Class	Traffic Factor ESAL Coefficients: Rigid (Fig. 54-4.C) Csu	Cmu	Flexible (Fig. 54-5.B) Csu	Cmu
I	143.81	696.42	132.50	482.53
II	135.78	567.21	112.06	385.44
III	129.58	562.47	109.14	384.35
IV	129.58	562.47	109.14	384.35

Class Table for 2 or 3 lanes (not future 4 lane & not one-way street)	
ADT	Class
0 - 749	IV
750 - 2000	III
>2000	II

Number of Lanes	Design Lane Distribution Factors For Structural Design Traffic (Fig. 54-2.B): Rural P	S	M	Urban P	S	M
1 Lane Ramp	100%	100%	100%	100%	100%	100%
2 or 3	50%	50%	50%	50%	50%	50%
4	32%	45%	45%	32%	45%	45%
6 or more	20%	40%	40%	8%	37%	37%

BDE 5401 Template (Rev. 10/05/2012) Printed: 11/07/2013

LIFE-CYCLE COST ANALYSIS: NEW CONSTRUCTION / RECONSTRUCTION

FULL-DEPTH HMA PAVEMENT

Standard Design

ROUTE			Job Route
SECTION			Job Section
COUNTY			Job County
LOCATION			Job Location
FACILITY TYPE			NON-INTERSTATE
PROJECT LENGTH			1000 FT = = > 0.19 Miles
# OF CENTERLINES			2 CL
# OF LANES			4 LANES
# OF EDGES			4 EP
LANE WIDTH - AVERAGE			12 FT
SHOULDER WIDTH	HMA	Inside	6 FT
	HMA	Outside	10 FT

PAVEMENT THICKNESS (FLEXIBLE)	12.00 IN	17.00 IN MAX	
SHOULDER THICKNESS	12.00 IN		Standard Design
POLICY OVERLAY THICKNESS	2.25 IN		

FLEX PAVEMENT TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
	7.11	1.00	7.11

Read Me!

HMA COST PER TON	UNIT PRICE
HMA SURFACE	$95.00 / TON
HMA TOP BINDER	$90.00 / TON
HMA LOWER BINDER	$85.00 / TON
HMA BINDER (LEVELING)	$95.00 / TON
HMA SHOULDER	$85.00 / TON

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT		UNIT PRICE		COST	
HMA PAVEMENT (FULL-DEPTH)	(12.00")	5,333	SQ YD		$61.27	/ SQ YD	$326,781	~
HMA SURFACE COURSE	(2.00")	5,333	SQ YD		$10.71	/ SQ YD	$0	
HMA TOP BINDER COURSE	(2.25")	5,333	SQ YD		$11.59	/ SQ YD	$0	
HMA LOWER BINDER COURSE	(7.75")	5,333	SQ YD		$38.97	/ SQ YD	$0	
HMA SHOULDER	(12.00")	3,556	SQ YD	*	$41.73	/ SQ YD	$148,373	~
CURB & GUTTER		0	LIN FT		$30.00	/ LIN FT	$0	
SUBBASE GRAN MATL TY C (TONS)		0	TONS		$25.00	/ TON	$0	
IMPROVED SUBGRADE:	Aggregate	5,333	SQ YD	*	$10.00	/ SQ YD	$53,330	
Reserved For User Supplied Item		0	UNITS		$0.00	/ UNITS	$0	
Reserved For User Supplied Item		0	UNITS		$0.00	/ UNITS	$0	
PAVEMENT REMOVAL		5,333	SQ YD		$0.00	/ SQ YD	$0	
SHOULDER REMOVAL		3,556	SQ YD		$0.00	/ SQ YD	$0	

Note: * Denotes User Supplied Quantity

FLEXIBLE CONSTRUCTION INITIAL COST	$528,484
FLEXIBLE CONSTRUCTION ANNUAL COST PER MILE	$113,807

MAINTENANCE COSTS:

ITEM	THICKNESS	MATERIAL	UNIT COST	
ROUTINE MAINTENANCE ACTIVITY			$0.00	LANE-MILE / YEAR
HMA OVERLAY PVMT SURF	(2.00")	Surface Mix	$10.00	/ SQ YD
HMA OVERLAY PVMT	(2.25")		$11.25	/ SQ YD
HMA SURFACE MIX	(1.50")	Surface Mix	$7.50	/ SQ YD
HMA BINDER MIX	(0.75")	eling Binder Mix	$3.75	/ SQ YD
HMA OVERLAY SHLD (Year 30)	(2.25")	Shoulder Mix	$11.25	/ SQ YD
HMA OVERLAY SHLD	(2.00")	Shoulder Mix	$10.00	/ SQ YD
MILLING (2.00 IN)			$2.50	/ SQ YD
PARTIAL DEPTH PVMT PATCH	(Mill & Fill Surf)	Surface Mix	$90.83	/ SQ YD
PARTIAL DEPTH SHLD PATCH	(Mill & Fill Surf)	Shoulder Mix	$89.71	/ SQ YD
PARTIAL DEPTH PVMT PATCH	(Mill & Fill +2.00 ")	Leveling Binder Mix	$90.83	/ SQ YD
PARTIAL DEPTH SHLD PATCH	(Mill & Fill +2.00 ")	Shoulder Mix	$89.71	/ SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL			$2.00	/ LIN FT
CENTERLINE JOINT ROUT & SEAL			$2.00	/ LIN FT
RANDOM / THERMAL CRACK ROUT & SEAL	(100% Rehab = 110.00' / Station / Lane)		$2.00	/ LIN FT

FLEXIBLE TOTAL LIFE-CYCLE COST	$717,252
FLEXIBLE TOTAL ANNUAL COST PER MILE	$154,457

HMA_SD

MAINTENANCE AND REHABILITATION ACTIVITY SCHEDULE

11/07/13

FULL-DEPTH HMA PAVEMENT
HMA OVERLAY OF RUBBLIZED PCC PAVEMENT
Figure 54-7.C
STANDARD DESIGN

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST	COST	PRESENT WORTH
YEAR 5							
	LONG SHLD JT R&S	100.00%	4,000	LIN FT	$2.00	$8,000	
	CNTR LINE JOINT R&S	100.00%	2,000	LIN FT	$2.00	$4,000	
	RNDM / THRM CRACK R&S	50.00%	2,200	LIN FT	$2.00	$4,400	
	PD PVMT PATCH M&F SURF	0.10%	5	SQ YD	$90.83	$454	
	PWFn =	0.8626		PW =	0.8626 X	$16,854	$14,538
YEAR 10							
	LONG SHLD JT R&S	100.00%	4,000	LIN FT	$2.00	$8,000	
	CNTR LINE JOINT R&S	100.00%	2,000	LIN FT	$2.00	$4,000	
	RNDM / THRM CRACK R&S	50.00%	2,200	LIN FT	$2.00	$4,400	
	PD PVMT PATCH M&F SURF	0.50%	27	SQ YD	$90.83	$2,452	
	PWFn =	0.7441		PW =	0.7441 X	$18,852	$14,028
YEAR 15							
	MILL PVMT & SHLD 2.00"	100.00%	8,889	SQ YD	$2.50	$22,223	
	PD PVMT PATCH M&F ADD'L 2.00"	1.00%	53	SQ YD	$90.83	$4,814	
	HMA OVERLAY PVMT 2.00"	100.00%	5,333	SQ YD	$10.00	$53,333	
	HMA OVERLAY SHLD 2.00 "	100.00%	3,556	SQ YD	$10.00	$35,556	
	PWFn =	0.6419		PW =	0.6419 X	$115,926	$74,408
YEAR 20							
	LONG SHLD JT R&S	100.00%	4,000	LIN FT	$2.00	$8,000	
	CNTR LINE JOINT R&S	100.00%	2,000	LIN FT	$2.00	$4,000	
	RNDM / THRM CRACK R&S	50.00%	2,200	LIN FT	$2.00	$4,400	
	PD PVMT PATCH M&F SURF	0.10%	5	SQ YD	$90.83	$454	
	PWFn =	0.5537		PW =	0.5537 X	$16,854	$9,332
YEAR 25							
	LONG SHLD JT R&S	100.00%	4,000	LIN FT	$2.00	$8,000	
	CNTR LINE JOINT R&S	100.00%	2,000	LIN FT	$2.00	$4,000	
	RNDM / THRM CRACK R&S	50.00%	2,200	LIN FT	$2.00	$4,400	
	PD PVMT PATCH M&F SURF	0.50%	27	SQ YD	$90.83	$2,452	
	PWFn =	0.4776		PW =	0.4776 X	$18,852	$9,004
	HMA_SD						
YEAR 30	NON-INTERSTATE						
	MILL PVMT & SHLD 2.00"	100.00%	8,889	SQ YD	$2.50	$22,223	
	PD PVMT PATCH M&F ADD'L 2.00"	2.00%	107	SQ YD	$90.83	$9,719	
	PD SHLD PATCH M&F ADD'L 2.00"	1.00%	36	SQ YD	$89.71	$3,230	
	HMA OVERLAY PVMT 2.25 "	100.00%	5,333	SQ YD	$11.25	$60,000	
	HMA OVERLAY SHLD 2.25 "	100.00%	3,556	SQ YD	$11.25	$40,000	
	PWFn =	0.4120		PW =	0.4120 X	$135,172	$55,689
YEAR 35							
	LONG SHLD JT R&S	100.00%	4,000	LIN FT	$2.00	$8,000	
	CNTR LINE JOINT R&S	100.00%	2,000	LIN FT	$2.00	$4,000	
	RNDM / THRM CRACK R&S	50.00%	2,200	LIN FT	$2.00	$4,400	
	PD PVMT PATCH M&F SURF	0.10%	5	SQ YD	$90.83	$454	
	PWFn =	0.3554		PW =	0.3554 X	$16,854	$5,990
YEAR 40							
	LONG SHLD JT R&S	100.00%	4,000	LIN FT	$2.00	$8,000	
	CNTR LINE JOINT R&S	100.00%	2,000	LIN FT	$2.00	$4,000	
	RNDM / THRM CRACK R&S	50.00%	2,200	LIN FT	$2.00	$4,400	
	PD PVMT PATCH M&F SURF	0.50%	27	SQ YD	$90.83	$2,452	
	PWFn =	0.3066		PW =	0.3066 X	$18,852	$5,779
							$188,768
	ROUTINE MAINTENANCE ACTIVITY		0.76	Lane Miles	0.00	$0	$0
					MAINTENANCE LIFE-CYCLE COST		$188,768
45	YEAR LIFE CYCLE	CRFn = 0.0407852			MAINTENANCE ANNUAL COST PER MILE		$40,650

PCC PAVEMENT

JPCP

ROUTE			**Job Route**	
SECTION			**Job Section**	
COUNTY			**Job County**	
LOCATION			**Job Location**	
FACILITY TYPE			**NON-INTERSTATE**	
PROJECT LENGTH			**1000** FT = = >	0.19 Miles
# OF CENTERLINES			**2** CL	
# OF LANES			**4** LANES	
# OF EDGES			**4** EP	
LANE WIDTH - AVERAGE			**12** FT	
SHOULDER WIDTH	PCC	Inside	**6** FT	
	PCC	Outside	**10** FT	

PAVEMENT THICKNESS (RIGID)	**JPCP**	**10.00** IN	TIED SHLD
SHOULDER THICKNESS		**10.00** IN	
POLICY OVERLAY THICKNESS		**2.50** IN	

RIGID PAVEMENT TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
	10.05	**1.00**	**10.05**
Worksheet Construction Type is New Construction		**The Pavement Type is**	**JPCP**

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT		UNIT PRICE		COST
JPC PAVEMENT	(10.00")	5,333	SQ YD		**$50.00**	/ SQ YD	$266,650
PAVEMENT REINFORCEMENT		0	SQ YD		**$0.00**	/ SQ YD	$0
STABILIZED SUBBASE	(4.50")	6,000	SQ YD		**$0.00**	/ SQ YD	$0
PCC SHOULDERS	(10.00" to 10.00")	3,556	SQ YD		**$45.00**	/ SQ YD	$160,020
CURB & GUTTER		0	LIN FT		**$30.00**	/ LIN FT	$0
SUBBASE GRAN MATL TY C	(~ 4.23")	0	TONS	*	**$25.00**	/ TON	$0
IMPROVED SUBGRADE:	Aggregate	5,333	SQ YD	*	**$10.00**	/ SQ YD	$53,330
Reserved For User Supplied Item		0	**UNITS**		**$0.00**	/ UNITS	$0
Reserved For User Supplied Item		0	**UNITS**		**$0.00**	/ UNITS	$0
PAVEMENT REMOVAL		5,333	SQ YD		**$0.00**	/ SQ YD	$0
SHOULDER REMOVAL		3,556	SQ YD		**$0.00**	/ SQ YD	$0

Note: * Denotes User Supplied Quantity

RIGID CONSTRUCTION INITIAL COST	$480,000
RIGID CONSTRUCTION ANNUAL COST PER MILE	$103,366

MAINTENANCE COSTS:

ITEM	THICKNESS	MATERIAL		UNIT COST	
ROUTINE MAINTENANCE ACTIVITY				**$0.00**	/ LANE-MILE / YEAR
HMA POLICY OVERLAY	(2.50")				
HMA POLICY OVERLAY PVMT	(2.50")			**$12.50**	/ SQ YD
HMA SURFACE MIX	(1.50")	Surface Mix		**$7.50**	/ SQ YD
HMA BINDER MIX	(1.00")	eling Binder Mix		**$5.00**	/ SQ YD
HMA POLICY OVERLAY SHLD	(2.50")	Shoulder Mix		**$12.50**	/ SQ YD
CLASS A PAVEMENT PATCHING				**$170.00**	/ SQ YD
CLASS B PAVEMENT PATCHING				**$130.00**	/ SQ YD
CLASS C SHOULDER PATCHING				**$110.00**	/ SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA Surf)		Surface Mix		**$88.17**	/ SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA 2.50")		Surface Mix		**$93.49**	/ SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL				**$2.00**	/ LIN FT
CENTERLINE JOINT ROUT & SEAL				**$2.00**	/ LIN FT
REFLECTIVE TRANSVERSE CRACK ROUT & SEAL				**$2.00**	/ LIN FT
RANDOM CRACK ROUT & SEAL	(100% Rehab = 100.00' / Station / Lane)			**$2.00**	/ LIN FT

RIGID TOTAL LIFE-CYCLE COST	$582,960
RIGID TOTAL ANNUAL COST PER MILE	$125,538

MAINTENANCE AND REHABILITATION ACTIVITY SCHEDULE 11/07/13

JOINTED PLAIN CONCRETE PAVEMENT
UNBONDED JOINTED PLAIN CONCRETE OVERLAY
Figure 54-7.A

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST		COST	PRESENT WORTH
YEAR 10								
	PAVEMENT PATCH CLASS B	0.10%	5	SQ YD	$130.00		$650	
	PWFn =	0.7441		PW =	0.7441	X	$650	$484
YEAR 15								
	PAVEMENT PATCH CLASS B	0.20%	11	SQ YD	$130.00		$1,430	
	PWFn =	0.6419		PW =	0.6419	X	$1,430	$918
YEAR 20								
	PAVEMENT PATCH CLASS B	2.00%	107	SQ YD	$130.00		$13,910	
	SHOULDER PATCH CLASS C	0.50%	18	SQ YD	$110.00		$1,980	
	LONGITUDINAL SHLD JT R&S	100.00%	4,000	LIN FT	$2.00		$8,000	
	CENTERLINE JT R&S	100.00%	2,000	LIN FT	$2.00		$4,000	
	PWFn =	0.5537		PW =	0.5537	X	$27,890	$15,442
YEAR 25								
	PAVEMENT PATCH CLASS B	3.00%	160	SQ YD	$130.00		$20,800	
	SHOULDER PATCH CLASS C	1.00%	36	SQ YD	$110.00		$3,960	
	PWFn =	0.4776		PW =	0.4776	X	$24,760	$11,826
YEAR 30	NON-INTERSTATE							
	PAVEMENT PATCH CLASS B	4.00%	213	SQ YD	$130.00		$27,690	
	SHOULDER PATCH CLASS C	1.50%	53	SQ YD	$110.00		$5,830	
	HMA POLICY OVERLAY 2.5" (PVMT)	100.00%	5,333	SQ YD	$12.50		$66,667	
	HMA POLICY OVERLAY 2.5" (SHLD)	100.00%	3,556	SQ YD	$12.50		$44,445	
	PWFn =	0.4120		PW =	0.4120	X	$144,632	$59,586
YEAR 35	NON-INTERSTATE							
	LONGITUDINAL SHLD JT R&S	100.00%	4,000	LIN FT	$2.00		$8,000	
	CENTERLINE JT R&S	100.00%	2,000	LIN FT	$2.00		$4,000	
	RANDOM CRACK R&S	50.00%	2,000	LIN FT	$2.00		$4,000	
	REFLECTIVE TRANSVERSE CRACK R&S	40.00%	1,286	LIN FT	$2.00		$2,572	
	PD PVMT PATCH M&F HMA 2.50"	0.10%	5	SQ YD	$93.49		$467	
	PWFn =	0.3554		PW =	0.3554	X	$19,039	$6,766
YEAR 40	NON-INTERSTATE							
	PAVEMENT PATCH CLASS B	0.50%	27	SQ YD	$130.00		$3,510	
	LONGITUDINAL SHLD JT R&S	100.00%	4,000	LIN FT	$2.00		$8,000	
	CENTERLINE JT R&S	100.00%	2,000	LIN FT	$2.00		$4,000	
	REFLECTIVE TRANSVERSE CRACK R&S	60.00%	1,930	LIN FT	$2.00		$3,860	
	RANDOM CRACK R&S	50.00%	2,000	LIN FT	$2.00		$4,000	
	PD PVMT PATCH M&F HMA 2.50"	0.50%	27	SQ YD	$93.49		$2,524	
	PWFn =	0.3066		PW =	0.3066	X	$25,894	$7,938
								$102,960
	ROUTINE MAINTENANCE ACTIVITY		0.76	Lane Miles	$0.00		$0	$0
					MAINTENANCE LIFE-CYCLE COST			$102,960
45	YEAR LIFE CYCLE	CRFn = 0.0407852			MAINTENANCE ANNUAL COST PER MILE			$22,172

LIFE-CYCLE COST ANALYSIS: NEW DESIGN

Calculated / Revised : 10/4/12 3:26 PM

			JPCP	HMA
CONSTRUCTION	INITIAL COST	PRESENT WORTH	$480,000	$528,484
		ANNUAL COST PER MILE	$103,366	$113,807
MAINTENANCE	LIFE-CYCLE COST	PRESENT WORTH	$102,960	$188,768
		ANNUAL COST PER MILE	$22,172	$40,650
TOTAL	LIFE-CYCLE COST	PRESENT WORTH	$582,960	$717,252
		ANNUAL COST PER MILE	$125,538	$154,457

LIFE-CYCLE COST ANALYSIS: FINAL SUMMARY

LOWEST COST OPTION	==========>	**JPCP**	**$125,538**	
OTHER OPTIONS (LOWEST TO HIGHEST):	TYPE / PERCENTAGE	**HMA**	**$154,457**	**23.0%**

P:\Pavement Design Stuff\D-1\US 45 from IL 60 to IL 22 06-18-13\2 - US 45 and IL 60\[US 45 at IL 60 IDOT Mechanistic Pavement Design with LCCA_10-11-12.xls

BDE 5401 Template (Rev. 10/05/2012)

IDOT MECHANISTIC PAVEMENT DESIGN

Printed: 11/07/2013

PROJECT AND TRAFFIC INPUTS

(Enter Data in Gray Shaded Cells)

Route: IL 83
Section: 49-Y
County: Lake
Location: 100ft South Of Osage Rd to US 45
Comments:
Design Date: 05/14/2013 <-- BY
Modify Date: 05/14/2013 <-- BY

	ADT	Year
Current:	33,020	2002
Future:	38,000	2030

Facility Type: Other Marked State Route
# of Lanes = 4
Road Class: I
Subgrade Support Rating (SSR): Poor
Construction Year: 2013
Design Period (DP) = 20 years

	Minimum ADT	Structural Design Traffic: Actual ADT	Actual %of Total ADT	% of ADT in Design Lane
PV =	0	35,039	95.3%	P = 32%
SU =	250	735	2.0%	S = 45%
MU =	750	981	2.7%	M = 45%
Struct. Design ADT =		36,755	(2023)	

TRAFFIC FACTOR CALCULATION

FLEXIBLE PAVEMENT			RIGID PAVEMENT		
Cpv =	0.15		Cpv =	0.15	
Csu =	132.5		Csu =	143.81	
Cmu =	482.53		Cmu =	696.42	
TF flexible (Actual) =	5.17	(Actual ADT)	TF rigid (Actual) =	7.14	(Actual ADT)
TF flexible (Min) =	3.56	(Min ADT Fig. 54-2.C)	TF rigid (Min) =	5.02	(Min ADT Fig. 54-2.C)

NEW CONSTRUCTION / RECONSTRUCTION PAVEMENT DESIGN CALCULATIONS

Full-Depth HMA Pavement

Use TF flexible = 5.17
PG Grade Lower Binder Lifts = PG 64-22 (Fig. 53-4.R)
Goto Map
HMA Mixture Temp. = 73.0 deg. F (Fig. 54-5.C)
Design HMA Mixture Modulus (E_{HMA}) = 760 ksi (Fig. 54-5.D)
Design HMA Strain (ε_{HMA}) = 75 (Fig. 54-5.E)
Goto Map
Full Depth HMA Design Thickness = 10.50 in. (Fig. 54-5.F)
Limiting Strain Criterion Thickness = 14.25 in. (Fig. 54-5.I)

Use Full-Depth HMA Thickness = 10.50 inches

JPC Pavement

Use TF rigid = 7.14
Edge Support = Tied Shoulder or C.&G.

Rigid Pavt Thick. = 9.50 in. (Fig. 54-4.E)

CRC Pavement

Use TF rigid = 7.14
IBR value = 2

CRCP Thickness = 8.75 in. (Fig. 54-4.M)

TF MUST BE > 60 FOR CRCP

RECONSTRUCTION ONLY (SUPPLEMENTAL) PAVEMENT DESIGN CALCULATIONS

HMA Overlay of Rubblized PCC

Use TF flexible = 5.17
District = 3,4,5,6

HMA Overlay Design Thickness = 8.75 in. (Fig. 54-5.U)

Unbonded Concrete Overlay

Review 54-4.03 for limitations and special considerations.

JPCP Thickness = NA inches

CONTACT BMPR FOR ASSISTANCE

DESIGN TABLES FROM BDE MANUAL CHAPTER 54 - PAVEMENT DESIGN

Class I Roads	Class II Roads	Class III Roads	Class IV Roads
4 lanes or more Part of a future 4 lanes or more One-way Streets with ADT > 3500	2 lanes with ADT > 2000 One way Street with ADT <= 3500	2 Lanes (ADT 750 -2000)	2 Lanes (ADT < 750)

Facility Type	Min. Str. Design Traffic (Fig 54-2.C) PV	SU	MU
Interstate or Supplemental Freeway	0	500	1500
Other Marked State Route	0	250	750
Unmarked State Route	No Min	No Min	No Min

Class Table for One-Way Streets	
ADT	Class
0 - 3500	II
>3501	I

Class	Traffic Factor ESAL Coefficients: Rigid (Fig. 54-4.C) Csu	Cmu	Flexible (Fig. 54-5.B) Csu	Cmu
I	143.81	696.42	132.50	482.53
II	135.78	567.21	112.06	385.44
III	129.58	562.47	109.14	384.35
IV	129.58	562.47	109.14	384.35

Class Table for 2 or 3 lanes (not future 4 lane & not one-way street)	
ADT	Class
0 - 749	IV
750 - 2000	III
>2000	II

Number of Lanes	Design Lane Distribution Factors For Structural Design Traffic (Fig. 54-2.B): Rural P	S	M	Urban P	S	M
1 Lane Ramp	100%	100%	100%	100%	100%	100%
2 or 3	50%	50%	50%	50%	50%	50%
4	32%	45%	45%	32%	45%	45%
6 or more	20%	40%	40%	8%	37%	37%

BDE 5401 Template (Rev. 10/05/2012) Printed: 11/07/2013

LIFE-CYCLE COST ANALYSIS: NEW CONSTRUCTION / RECONSTRUCTION

FULL-DEPTH HMA PAVEMENT

Standard Design

ROUTE			IL 83
SECTION			49-Y
COUNTY			Lake
LOCATION			100ft South Of Osage Rd to US 45
FACILITY TYPE			INTERSTATE
PROJECT LENGTH			680 FT = = > 0.13 Miles
# OF CENTERLINES			1 CL
# OF LANES			4 LANES
# OF EDGES			2 EP
LANE WIDTH - AVERAGE			12 FT
SHOULDER WIDTH	HMA	Inside	0 FT
	HMA	Outside	0 FT

PAVEMENT THICKNESS (FLEXIBLE)	11.00 IN	14.25 IN MAX
SHOULDER THICKNESS	8.00 IN	Standard Design
POLICY OVERLAY THICKNESS	3.75 IN	

FLEX PAVEMENT TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
	7.11	5.17	7.11

Read Me!

HMA COST PER TON	UNIT PRICE
HMA SURFACE	$95.00 / TON
HMA TOP BINDER	$90.00 / TON
HMA LOWER BINDER	$85.00 / TON
HMA BINDER (LEVELING)	$95.00 / TON
HMA SHOULDER	$85.00 / TON

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT		UNIT PRICE	COST
HMA PAVEMENT (FULL-DEPTH)	(11.00")	3,627	SQ YD		$55.12 / SQ YD	$199,904 ~
HMA SURFACE COURSE	(2.00")	3,627	SQ YD	*	$10.86 / SQ YD	$0
HMA TOP BINDER COURSE	(2.25")	3,627	SQ YD	*	$10.37 / SQ YD	$0
HMA LOWER BINDER COURSE	(6.75")	3,627	SQ YD	*	$25.79 / SQ YD	$0
HMA SHOULDER	(8.00")	0	SQ YD	*	$41.73 / SQ YD	$0 ~
CURB & GUTTER		0	LIN FT		$30.00 / LIN FT	$0
SUBBASE GRAN MATL TY C (TONS)		11	TONS		$25.00 / TON	$275
IMPROVED SUBGRADE:	Aggregate	5,333	SQ YD	*	$10.00 / SQ YD	$53,330
Reserved For User Supplied Item		0	UNITS		$0.00 / UNITS	$0
Reserved For User Supplied Item		0	UNITS		$0.00 / UNITS	$0
PAVEMENT REMOVAL		3,627	SQ YD		$0.00 / SQ YD	$0
SHOULDER REMOVAL		0	SQ YD		$0.00 / SQ YD	$0

Note: * Denotes User Supplied Quantity

FLEXIBLE CONSTRUCTION INITIAL COST	$253,509
FLEXIBLE CONSTRUCTION ANNUAL COST PER MILE	$80,282

MAINTENANCE COSTS:

ITEM	THICKNESS	MATERIAL	UNIT COST
ROUTINE MAINTENANCE ACTIVITY			$0.00 LANE-MILE / YEAR
HMA OVERLAY PVMT SURF	(2.00")	Surface Mix	$10.86 / SQ YD
HMA OVERLAY PVMT	(3.75")		$20.36 / SQ YD
HMA SURFACE MIX	(1.50")	Surface Mix	$9.50 / SQ YD
HMA BINDER MIX	(2.25")	Top Binder Mix	$10.86 / SQ YD
HMA OVERLAY SHLD (Year 30)	(1.75")	Shoulder Mix	$9.50 / SQ YD
HMA OVERLAY SHLD	(2.00")	Shoulder Mix	$10.86 / SQ YD
MILLING (2.00 IN)			$2.50 / SQ YD
PARTIAL DEPTH PVMT PATCH	(Mill & Fill Surf)	Surface Mix	$90.83 / SQ YD
PARTIAL DEPTH SHLD PATCH	(Mill & Fill Surf)	Shoulder Mix	$89.71 / SQ YD
PARTIAL DEPTH PVMT PATCH	(Mill & Fill +2.00 ")	Leveling Binder Mix	$90.83 / SQ YD
PARTIAL DEPTH SHLD PATCH	(Mill & Fill +2.00 ")	Shoulder Mix	$89.71 / SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL			$2.00 / LIN FT
CENTERLINE JOINT ROUT & SEAL			$2.00 / LIN FT
RANDOM / THERMAL CRACK ROUT & SEAL	(100% Rehab = 110.00' / Station / Lane)		$2.00 / LIN FT

FLEXIBLE TOTAL LIFE-CYCLE COST	$350,080
FLEXIBLE TOTAL ANNUAL COST PER MILE	$110,865

HMA_SD

MAINTENANCE AND REHABILITATION ACTIVITY SCHEDULE

11/07/13

FULL-DEPTH HMA PAVEMENT
HMA OVERLAY OF RUBBLIZED PCC PAVEMENT
Figure 54-7.C
STANDARD DESIGN

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST		COST	PRESENT WORTH
YEAR 5								
	LONG SHLD JT R&S	100.00%	1,360	LIN FT	$2.00		$2,720	
	CNTR LINE JOINT R&S	100.00%	680	LIN FT	$2.00		$1,360	
	RNDM / THRM CRACK R&S	50.00%	1,496	LIN FT	$2.00		$2,992	
	PD PVMT PATCH M&F SURF	0.10%	4	SQ YD	$90.83		$363	
	PWFn =	0.8626		PW =	0.8626	X	$7,435	$6,413
YEAR 10								
	LONG SHLD JT R&S	100.00%	1,360	LIN FT	$2.00		$2,720	
	CNTR LINE JOINT R&S	100.00%	680	LIN FT	$2.00		$1,360	
	RNDM / THRM CRACK R&S	50.00%	1,496	LIN FT	$2.00		$2,992	
	PD PVMT PATCH M&F SURF	0.50%	18	SQ YD	$90.83		$1,635	
	PWFn =	0.7441		PW =	0.7441	X	$8,707	$6,479
YEAR 15								
	MILL PVMT & SHLD 2.00"	100.00%	3,627	SQ YD	$2.50		$9,068	
	PD PVMT PATCH M&F ADD'L 2.00"	1.00%	36	SQ YD	$90.83		$3,270	
	HMA OVERLAY PVMT 2.00"	100.00%	3,627	SQ YD	$10.86		$39,386	
	HMA OVERLAY SHLD 2.00 "	100.00%	0	SQ YD	$10.86		$0	
	PWFn =	0.6419		PW =	0.6419	X	$51,724	$33,200
YEAR 20								
	LONG SHLD JT R&S	100.00%	1,360	LIN FT	$2.00		$2,720	
	CNTR LINE JOINT R&S	100.00%	680	LIN FT	$2.00		$1,360	
	RNDM / THRM CRACK R&S	50.00%	1,496	LIN FT	$2.00		$2,992	
	PD PVMT PATCH M&F SURF	0.10%	4	SQ YD	$90.83		$363	
	PWFn =	0.5537		PW =	0.5537	X	$7,435	$4,117
YEAR 25								
	LONG SHLD JT R&S	100.00%	1,360	LIN FT	$2.00		$2,720	
	CNTR LINE JOINT R&S	100.00%	680	LIN FT	$2.00		$1,360	
	RNDM / THRM CRACK R&S	50.00%	1,496	LIN FT	$2.00		$2,992	
	PD PVMT PATCH M&F SURF	0.50%	18	SQ YD	$90.83		$1,635	
	PWFn =	0.4776		PW =	0.4776	X	$8,707	$4,159
	HMA_SD							
YEAR 30	INTERSTATE							
	MILL PVMT ONLY 2.00"	100.00%	3,627	SQ YD	$2.50		$9,068	
	PD PVMT PATCH M&F ADD'L 2.00"	2.00%	73	SQ YD	$90.83		$6,631	
	PD SHLD PATCH M&F SURF 2.00"	1.00%	0	SQ YD	$89.71		$0	
	HMA OVERLAY PVMT 3.75 "	100.00%	3,627	SQ YD	$20.36		$73,848	
	HMA OVERLAY SHLD 1.75 "	100.00%	0	SQ YD	$9.50		$0	
	PWFn =	0.4120		PW =	0.4120	X	$89,547	$36,892
YEAR 35								
	LONG SHLD JT R&S	100.00%	1,360	LIN FT	$2.00		$2,720	
	CNTR LINE JOINT R&S	100.00%	680	LIN FT	$2.00		$1,360	
	RNDM / THRM CRACK R&S	50.00%	1,496	LIN FT	$2.00		$2,992	
	PD PVMT PATCH M&F SURF	0.10%	4	SQ YD	$90.83		$363	
	PWFn =	0.3554		PW =	0.3554	X	$7,435	$2,642
YEAR 40								
	LONG SHLD JT R&S	100.00%	1,360	LIN FT	$2.00		$2,720	
	CNTR LINE JOINT R&S	100.00%	680	LIN FT	$2.00		$1,360	
	RNDM / THRM CRACK R&S	50.00%	1,496	LIN FT	$2.00		$2,992	
	PD PVMT PATCH M&F SURF	0.50%	18	SQ YD	$90.83		$1,635	
	PWFn =	0.3066		PW =	0.3066	X	$8,707	$2,669
								$96,571
	ROUTINE MAINTENANCE ACTIVITY		0.52	Lane Miles	0.00		$0	$0
					MAINTENANCE LIFE-CYCLE COST			$96,571
45	YEAR LIFE CYCLE	CRFn = 0.0407852			MAINTENANCE ANNUAL COST PER MILE			$30,583

PCC PAVEMENT

JPCP

ROUTE			IL 83		
SECTION			49-Y		
COUNTY			Lake		
LOCATION			100ft South Of Osage Rd to US 45		
FACILITY TYPE			INTERSTATE		
PROJECT LENGTH			680 FT	= = >	0.13 Miles
# OF CENTERLINES			1 CL		
# OF LANES			4 LANES		
# OF EDGES			2 EP		
LANE WIDTH - AVERAGE			12 FT		
SHOULDER WIDTH	PCC	Inside	0 FT		
	PCC	Outside	0 FT		

PAVEMENT THICKNESS (RIGID)	JPCP	10.00 IN	TIED SHLD
SHOULDER THICKNESS		10.00 IN	
POLICY OVERLAY THICKNESS		3.75 IN	

RIGID PAVEMENT TRAFFIC FACTORS		MINIMUM	ACTUAL	USE
		10.05	7.14	10.05
Worksheet Construction Type is	New Construction		The Pavement Type is	JPCP

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT		UNIT PRICE		COST
JPC PAVEMENT	(10.00")	3,627	SQ YD		$40.52	/ SQ YD	$146,966
PAVEMENT REINFORCEMENT		0	SQ YD		$0.00	/ SQ YD	$0
STABILIZED SUBBASE	(4.50")	3,853	SQ YD		$15.00	/ SQ YD	$57,795
PCC SHOULDERS	(10.00" to 10.00")	0	SQ YD		$35.52	/ SQ YD	$0
CURB & GUTTER		0	LIN FT		$30.00	/ LIN FT	$0
SUBBASE GRAN MATL TY C	(~ 0.00")	11	TONS	*	$25.00	/ TON	$275
IMPROVED SUBGRADE:	Aggregate	5,333	SQ YD	*	$10.00	/ SQ YD	$53,330
Reserved For User Supplied Item		0	UNITS		$0.00	/ UNITS	$0
Reserved For User Supplied Item		0	UNITS		$0.00	/ UNITS	$0
PAVEMENT REMOVAL		3,627	SQ YD		$0.00	/ SQ YD	$0
SHOULDER REMOVAL		0	SQ YD		$0.00	/ SQ YD	$0

Note: * Denotes User Supplied Quantity

RIGID CONSTRUCTION INITIAL COST	$258,366
RIGID CONSTRUCTION ANNUAL COST PER MILE	$81,821

MAINTENANCE COSTS:

ITEM	THICKNESS	MATERIAL		UNIT COST	
ROUTINE MAINTENANCE ACTIVITY				$0.00	/ LANE-MILE / YEAR
HMA POLICY OVERLAY	(3.75")		3.75		
HMA POLICY OVERLAY PVMT	(3.75")		3.75	$20.36	/ SQ YD
HMA SURFACE MIX	(1.50")	Surface Mix	1.50	$8.15	/ SQ YD
HMA BINDER MIX	(2.25")	Top Binder Mix	2.25	$12.22	/ SQ YD
HMA POLICY OVERLAY SHLD	(3.75")	Shoulder Mix	3.75	$20.36	/ SQ YD
CLASS A PAVEMENT PATCHING				$170.00	/ SQ YD
CLASS B PAVEMENT PATCHING				$130.00	/ SQ YD
CLASS C SHOULDER PATCHING				$110.00	/ SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA Surf)		Surface Mix	1.50	$88.17	/ SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA 1.50")		Surface Mix	1.50	$88.17	/ SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL				$2.00	/ LIN FT
CENTERLINE JOINT ROUT & SEAL				$2.00	/ LIN FT
REFLECTIVE TRANSVERSE CRACK ROUT & SEAL				$2.00	/ LIN FT
RANDOM CRACK ROUT & SEAL	(100% Rehab = 100.00' / Station / Lane)			$2.00	/ LIN FT

RIGID TOTAL LIFE-CYCLE COST	$319,047
RIGID TOTAL ANNUAL COST PER MILE	$101,037

MAINTENANCE AND REHABILITATION ACTIVITY SCHEDULE 11/07/13

JOINTED PLAIN CONCRETE PAVEMENT
UNBONDED JOINTED PLAIN CONCRETE OVERLAY
Figure 54-7.A

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST		COST	PRESENT WORTH
YEAR 10								
	PAVEMENT PATCH CLASS B	0.10%	4	SQ YD	$130.00		$520	
	PWFn =	0.7441		PW =	0.7441	X	$520	$387
YEAR 15								
	PAVEMENT PATCH CLASS B	0.20%	7	SQ YD	$130.00		$910	
	PWFn =	0.6419		PW =	0.6419	X	$910	$584
YEAR 20								
	PAVEMENT PATCH CLASS B	2.00%	73	SQ YD	$130.00		$9,490	
	SHOULDER PATCH CLASS C	0.50%	0	SQ YD	$110.00		$0	
	LONGITUDINAL SHLD JT R&S	100.00%	1,360	LIN FT	$2.00		$2,720	
	CENTERLINE JT R&S	100.00%	680	LIN FT	$2.00		$1,360	
	PWFn =	0.5537		PW =	0.5537	X	$13,570	$7,513
YEAR 25								
	PAVEMENT PATCH CLASS B	3.00%	109	SQ YD	$130.00		$14,170	
	SHOULDER PATCH CLASS C	1.00%	0	SQ YD	$110.00		$0	
	PWFn =	0.4776		PW =	0.4776	X	$14,170	$6,768
YEAR 30	INTERSTATE							
	PAVEMENT PATCH CLASS B	4.00%	145	SQ YD	$130.00		$18,850	
	SHOULDER PATCH CLASS C	1.50%	0	SQ YD	$110.00		$0	
	HMA POLICY OVERLAY 3.75" (PVMT)	100.00%	3,627	SQ YD	$20.36		$73,848	
	HMA POLICY OVERLAY 3.75" (SHLD)	100.00%	0	SQ YD	$20.36		$0	
	PWFn =	0.4120		PW =	0.4120	X	$92,698	$38,190
YEAR 35	INTERSTATE							
	LONGITUDINAL SHLD JT R&S	100.00%	1,360	LIN FT	$2.00		$2,720	
	CENTERLINE JT R&S	100.00%	680	LIN FT	$2.00		$1,360	
	RANDOM CRACK R&S	50.00%	1,360	LIN FT	$2.00		$2,720	
	REFLECTIVE TRANSVERSE CRACK R&S	40.00%	864	LIN FT	$2.00		$1,728	
	PD PVMT PATCH M&F HMA SURF 1.50"	0.10%	4	SQ YD	$88.17		$353	
	PWFn =	0.3554		PW =	0.3554	X	$8,881	$3,156
YEAR 40	INTERSTATE							
	PAVEMENT PATCH CLASS B	0.50%	18	SQ YD	$130.00		$2,340	
	LONGITUDINAL SHLD JT R&S	100.00%	1,360	LIN FT	$2.00		$2,720	
	CENTERLINE JT R&S	100.00%	680	LIN FT	$2.00		$1,360	
	REFLECTIVE TRANSVERSE CRACK R&S	60.00%	1,296	LIN FT	$2.00		$2,592	
	RANDOM CRACK R&S	50.00%	1,360	LIN FT	$2.00		$2,720	
	PD PVMT PATCH M&F HMA SURF 1.50"	0.50%	18	SQ YD	$88.17		$1,587	
	PWFn =	0.3066		PW =	0.3066	X	$13,319	$4,083
								$60,681
	ROUTINE MAINTENANCE ACTIVITY		0.52	Lane Miles	$0.00		$0	$0
					MAINTENANCE LIFE-CYCLE COST			$60,681
45	YEAR LIFE CYCLE	CRFn = 0.0407852			MAINTENANCE ANNUAL COST PER MILE			$19,217

LIFE-CYCLE COST ANALYSIS: NEW DESIGN

Calculated / Revised : **5/21/13 11:37 AM**

			JPCP	HMA
CONSTRUCTION	INITIAL COST	PRESENT WORTH	$258,366	$253,509
		ANNUAL COST PER MILE	$81,821	$80,282
MAINTENANCE	LIFE-CYCLE COST	PRESENT WORTH	$60,681	$96,571
		ANNUAL COST PER MILE	$19,217	$30,583
TOTAL	LIFE-CYCLE COST	PRESENT WORTH	$319,047	$350,080
		ANNUAL COST PER MILE	$101,037	$110,865

LIFE-CYCLE COST ANALYSIS: FINAL SUMMARY

LOWEST COST OPTION	==========>	**JPCP**	**$101,037**	
OTHER OPTIONS (LOWEST TO HIGHEST):	TYPE / PERCENTAGE	**HMA**	**$110,865**	9.7%

BDE 5401 Template (Rev. 10/05/2012)

IDOT MECHANISTIC PAVEMENT DESIGN

Printed: 11/07/2013

PROJECT AND TRAFFIC INPUTS

(Enter Data in Gray Shaded Cells)

Route: US 45
Section: 49-Y
County: Lake
Location: at Butterfield Road
Facility Type: Other Marked State Route
# of Lanes = 4
Road Class: I
Subgrade Support Rating (SSR): Poor
Construction Year: 2013
Design Period (DP) = 20 years

Comments:
Design Date: 05/09/2013 CI <-- BY
Modify Date: <-- BY

	ADT	Year
Current:	19,200	2002
Future:	27,000	2030

	Structural Design Traffic			
	Minimum ADT	Actual ADT	Actual %of Total ADT	% of ADT in Design Lane
PV =	0	24,013	95.9%	P = 32%
SU =	250	554	2.2%	S = 45%
MU =	750	483	1.9%	M = 45%
		Struct. Design ADT =	25,050	(2023)

TRAFFIC FACTOR CALCULATION

FLEXIBLE PAVEMENT			RIGID PAVEMENT		
Cpv =	0.15		Cpv =	0.15	
Csu =	132.5		Csu =	143.81	
Cmu =	482.53		Cmu =	696.42	
TF flexible (Actual) =	2.78	(Actual ADT)	TF rigid (Actual) =	3.77	(Actual ADT)
TF flexible (Min) =	3.56	(Min ADT Fig. 54-2.C)	TF rigid (Min) =	5.02	(Min ADT Fig. 54-2.C)

NEW CONSTRUCTION / RECONSTRUCTION PAVEMENT DESIGN CALCULATIONS

Full-Depth HMA Pavement

Use TF flexible =	3.56	
PG Grade Lower Binder Lifts =	PG 64-22	(Fig. 53-4.R)
Goto Map — HMA Mixture Temp. =	74.5	deg. F (Fig. 54-5.C)
Design HMA Mixture Modulus (E_{HMA}) =	710	ksi (Fig. 54-5.D)
Design HMA Strain (ε_{HMA}) =	84	(Fig. 54-5.E)
Full Depth HMA Design Thickness =	10.00	in. (Fig. 54-5.F)
Goto Map — Limiting Strain Criterion Thickness =	14.75	in. (Fig. 54-5.I)
Use Full-Depth HMA Thickness =	**10.00**	**inches**

JPC Pavement

Use TF rigid =	5.02	
Edge Support =	Tied	Shoulder or C.&G.
Rigid Pavt Thick. =	**9.00**	**in. (Fig. 54-4.E)**

CRC Pavement

Use TF rigid =	5.02	
IBR value =	2	
CRCP Thickness =	**8.25**	**in. (Fig. 54-4.M)**

TF MUST BE > 60 FOR CRCP

RECONSTRUCTION ONLY (SUPPLEMENTAL) PAVEMENT DESIGN CALCULATIONS

HMA Overlay of Rubblized PCC

Use TF flexible =	3.56	
District =	3,4,5,6	
HMA Overlay Design Thickness =	**8.00**	**in. (Fig. 54-5.U)**

Unbonded Concrete Overlay

Review 54-4.03 for limitations and special considerations.

JPCP Thickness = NA inches

CONTACT BMPR FOR ASSISTANCE

DESIGN TABLES FROM BDE MANUAL CHAPTER 54 - PAVEMENT DESIGN

Class I Roads	Class II Roads	Class III Roads	Class IV Roads
4 lanes or more Part of a future 4 lanes or more One-way Streets with ADT > 3500	2 lanes with ADT > 2000 One way Street with ADT <= 3500	2 Lanes (ADT 750 -2000)	2 Lanes (ADT < 750)

	Min. Str. Design Traffic (Fig 54-2.C)		
Facility Type	PV	SU	MU
Interstate or Supplemental Freeway	0	500	1500
Other Marked State Route	0	250	750
Unmarked State Route	No Min	No Min	No Min

Class Table for One-Way Streets	
ADT	Class
0 - 3500	II
>3501	I

	Traffic Factor ESAL Coefficients			
	Rigid (Fig. 54-4.C)		Flexible (Fig. 54-5.B)	
Class	Csu	Cmu	Csu	Cmu
I	143.81	696.42	132.50	482.53
II	135.78	567.21	112.06	385.44
III	129.58	562.47	109.14	384.35
IV	129.58	562.47	109.14	384.35

Class Table for 2 or 3 lanes (not future 4 lane & not one-way street)	
ADT	Class
0 - 749	IV
750 - 2000	III
>2000	II

	Design Lane Distribution Factors For Structural Design Traffic (Fig. 54-2.B)					
	Rural			Urban		
Number of Lanes	P	S	M	P	S	M
1 Lane Ramp	100%	100%	100%	100%	100%	100%
2 or 3	50%	50%	50%	50%	50%	50%
4	32%	45%	45%	32%	45%	45%
6 or more	20%	40%	40%	8%	37%	37%

BDE 5401 Template (Rev. 10/05/2012) Printed: 11/07/2013

LIFE-CYCLE COST ANALYSIS: NEW CONSTRUCTION / RECONSTRUCTION

FULL-DEPTH HMA PAVEMENT

Standard Design

ROUTE			Job Route
SECTION			Job Section
COUNTY			Job County
LOCATION			Job Location
FACILITY TYPE			NON-INTERSTATE
PROJECT LENGTH			1000 FT = = > 0.19 Miles
# OF CENTERLINES			2 CL
# OF LANES			4 LANES
# OF EDGES			4 EP
LANE WIDTH - AVERAGE			12 FT
SHOULDER WIDTH	HMA	Inside	6 FT
	HMA	Outside	10 FT

PAVEMENT THICKNESS (FLEXIBLE)	12.00 IN	17.00 IN MAX
SHOULDER THICKNESS	12.00 IN	Standard Design
POLICY OVERLAY THICKNESS	2.25 IN	

FLEX PAVEMENT TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
	7.11	1.00	7.11

Read Me!

HMA COST PER TON	UNIT PRICE
HMA SURFACE	$95.00 / TON
HMA TOP BINDER	$90.00 / TON
HMA LOWER BINDER	$85.00 / TON
HMA BINDER (LEVELING)	$95.00 / TON
HMA SHOULDER	$85.00 / TON

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT		UNIT PRICE	COST
HMA PAVEMENT (FULL-DEPTH)	(12.00")	5,333	SQ YD		$61.27 / SQ YD	$326,781 ~
HMA SURFACE COURSE	(2.00")	5,333	SQ YD		$10.71 / SQ YD	$0
HMA TOP BINDER COURSE	(2.25")	5,333	SQ YD		$11.59 / SQ YD	$0
HMA LOWER BINDER COURSE	(7.75")	5,333	SQ YD		$38.97 / SQ YD	$0
HMA SHOULDER	(12.00")	3,556	SQ YD	*	$41.73 / SQ YD	$148,373 ~
CURB & GUTTER		0	LIN FT		$30.00 / LIN FT	$0
SUBBASE GRAN MATL TY C (TONS)		0	TONS		$25.00 / TON	$0
IMPROVED SUBGRADE:	Aggregate	5,333	SQ YD	*	$10.00 / SQ YD	$53,330
Reserved For User Supplied Item		0	UNITS		$0.00 / UNITS	$0
Reserved For User Supplied Item		0	UNITS		$0.00 / UNITS	$0
PAVEMENT REMOVAL		5,333	SQ YD		$0.00 / SQ YD	$0
SHOULDER REMOVAL		3,556	SQ YD		$0.00 / SQ YD	$0

Note: * Denotes User Supplied Quantity

FLEXIBLE CONSTRUCTION INITIAL COST	$528,484
FLEXIBLE CONSTRUCTION ANNUAL COST PER MILE	$113,807

MAINTENANCE COSTS:

ITEM		THICKNESS	MATERIAL	UNIT COST
ROUTINE MAINTENANCE ACTIVITY				$0.00 LANE-MILE / YEAR
HMA OVERLAY PVMT SURF		(2.00")	Surface Mix	$10.00 / SQ YD
HMA OVERLAY PVMT		(2.25")		$11.25 / SQ YD
HMA SURFACE MIX		(1.50")	Surface Mix	$7.50 / SQ YD
HMA BINDER MIX		(0.75")	eling Binder Mix	$3.75 / SQ YD
HMA OVERLAY SHLD	(Year 30)	(2.25")	Shoulder Mix	$11.25 / SQ YD
HMA OVERLAY SHLD		(2.00")	Shoulder Mix	$10.00 / SQ YD
MILLING (2.00 IN)				$2.50 / SQ YD
PARTIAL DEPTH PVMT PATCH		(Mill & Fill Surf)	Surface Mix	$90.83 / SQ YD
PARTIAL DEPTH SHLD PATCH		(Mill & Fill Surf)	Shoulder Mix	$89.71 / SQ YD
PARTIAL DEPTH PVMT PATCH		(Mill & Fill +2.00 ")	Leveling Binder Mix	$90.83 / SQ YD
PARTIAL DEPTH SHLD PATCH		(Mill & Fill +2.00 ")	Shoulder Mix	$89.71 / SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL				$2.00 / LIN FT
CENTERLINE JOINT ROUT & SEAL				$2.00 / LIN FT
RANDOM / THERMAL CRACK ROUT & SEAL		(100% Rehab = 110.00' / Station / Lane)		$2.00 / LIN FT

FLEXIBLE TOTAL LIFE-CYCLE COST	$717,252
FLEXIBLE TOTAL ANNUAL COST PER MILE	$154,457

MAINTENANCE AND REHABILITATION ACTIVITY SCHEDULE 11/07/13

FULL-DEPTH HMA PAVEMENT
HMA OVERLAY OF RUBBLIZED PCC PAVEMENT
Figure 54-7.C
STANDARD DESIGN

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST		COST	PRESENT WORTH
YEAR 5								
	LONG SHLD JT R&S	100.00%	4,000	LIN FT	$2.00		$8,000	
	CNTR LINE JOINT R&S	100.00%	2,000	LIN FT	$2.00		$4,000	
	RNDM / THRM CRACK R&S	50.00%	2,200	LIN FT	$2.00		$4,400	
	PD PVMT PATCH M&F SURF	0.10%	5	SQ YD	$90.83		$454	
	PWFn =	0.8626		PW =	0.8626	X	$16,854	$14,538
YEAR 10								
	LONG SHLD JT R&S	100.00%	4,000	LIN FT	$2.00		$8,000	
	CNTR LINE JOINT R&S	100.00%	2,000	LIN FT	$2.00		$4,000	
	RNDM / THRM CRACK R&S	50.00%	2,200	LIN FT	$2.00		$4,400	
	PD PVMT PATCH M&F SURF	0.50%	27	SQ YD	$90.83		$2,452	
	PWFn =	0.7441		PW =	0.7441	X	$18,852	$14,028
YEAR 15								
	MILL PVMT & SHLD 2.00"	100.00%	8,889	SQ YD	$2.50		$22,223	
	PD PVMT PATCH M&F ADD'L 2.00"	1.00%	53	SQ YD	$90.83		$4,814	
	HMA OVERLAY PVMT 2.00"	100.00%	5,333	SQ YD	$10.00		$53,333	
	HMA OVERLAY SHLD 2.00 "	100.00%	3,556	SQ YD	$10.00		$35,556	
	PWFn =	0.6419		PW =	0.6419	X	$115,926	$74,408
YEAR 20								
	LONG SHLD JT R&S	100.00%	4,000	LIN FT	$2.00		$8,000	
	CNTR LINE JOINT R&S	100.00%	2,000	LIN FT	$2.00		$4,000	
	RNDM / THRM CRACK R&S	50.00%	2,200	LIN FT	$2.00		$4,400	
	PD PVMT PATCH M&F SURF	0.10%	5	SQ YD	$90.83		$454	
	PWFn =	0.5537		PW =	0.5537	X	$16,854	$9,332
YEAR 25								
	LONG SHLD JT R&S	100.00%	4,000	LIN FT	$2.00		$8,000	
	CNTR LINE JOINT R&S	100.00%	2,000	LIN FT	$2.00		$4,000	
	RNDM / THRM CRACK R&S	50.00%	2,200	LIN FT	$2.00		$4,400	
	PD PVMT PATCH M&F SURF	0.50%	27	SQ YD	$90.83		$2,452	
	PWFn =	0.4776		PW =	0.4776	X	$18,852	$9,004
HMA_SD								
YEAR 30	NON-INTERSTATE							
	MILL PVMT & SHLD 2.00"	100.00%	8,889	SQ YD	$2.50		$22,223	
	PD PVMT PATCH M&F ADD'L 2.00"	2.00%	107	SQ YD	$90.83		$9,719	
	PD SHLD PATCH M&F ADD'L 2.00"	1.00%	36	SQ YD	$89.71		$3,230	
	HMA OVERLAY PVMT 2.25 "	100.00%	5,333	SQ YD	$11.25		$60,000	
	HMA OVERLAY SHLD 2.25 "	100.00%	3,556	SQ YD	$11.25		$40,000	
	PWFn =	0.4120		PW =	0.4120	X	$135,172	$55,689
YEAR 35								
	LONG SHLD JT R&S	100.00%	4,000	LIN FT	$2.00		$8,000	
	CNTR LINE JOINT R&S	100.00%	2,000	LIN FT	$2.00		$4,000	
	RNDM / THRM CRACK R&S	50.00%	2,200	LIN FT	$2.00		$4,400	
	PD PVMT PATCH M&F SURF	0.10%	5	SQ YD	$90.83		$454	
	PWFn =	0.3554		PW =	0.3554	X	$16,854	$5,990
YEAR 40								
	LONG SHLD JT R&S	100.00%	4,000	LIN FT	$2.00		$8,000	
	CNTR LINE JOINT R&S	100.00%	2,000	LIN FT	$2.00		$4,000	
	RNDM / THRM CRACK R&S	50.00%	2,200	LIN FT	$2.00		$4,400	
	PD PVMT PATCH M&F SURF	0.50%	27	SQ YD	$90.83		$2,452	
	PWFn =	0.3066		PW =	0.3066	X	$18,852	$5,779
								$188,768
	ROUTINE MAINTENANCE ACTIVITY		0.76	Lane Miles	0.00		$0	$0
					MAINTENANCE LIFE-CYCLE COST			$188,768
45	YEAR LIFE CYCLE	CRFn = 0.0407852			MAINTENANCE ANNUAL COST PER MILE			$40,650

PCC PAVEMENT

JPCP

ROUTE			**Job Route**	
SECTION			**Job Section**	
COUNTY			**Job County**	
LOCATION			**Job Location**	
FACILITY TYPE			**NON-INTERSTATE**	
PROJECT LENGTH			**1000** FT = = >	0.19 Miles
# OF CENTERLINES			**2** CL	
# OF LANES			**4** LANES	
# OF EDGES			**4** EP	
LANE WIDTH - AVERAGE			**12** FT	
SHOULDER WIDTH	PCC	Inside	**6** FT	
	PCC	Outside	**10** FT	

PAVEMENT THICKNESS (RIGID)	**JPCP**	**10.00** IN	TIED SHLD
SHOULDER THICKNESS		**10.00** IN	
POLICY OVERLAY THICKNESS		**2.50** IN	

RIGID PAVEMENT TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
	10.05	**1.00**	**10.05**
Worksheet Construction Type is New Construction		**The Pavement Type is**	**JPCP**

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT		UNIT PRICE		COST
JPC PAVEMENT	(10.00")	5,333	SQ YD		**$50.00**	/ SQ YD	$266,650
PAVEMENT REINFORCEMENT		0	SQ YD		**$0.00**	/ SQ YD	$0
STABILIZED SUBBASE	(4.50")	6,000	SQ YD		**$15.00**	/ SQ YD	$90,000
PCC SHOULDERS	(10.00" to 10.00")	3,556	SQ YD		**$45.00**	/ SQ YD	$160,020
CURB & GUTTER		0	LIN FT		**$30.00**	/ LIN FT	$0
SUBBASE GRAN MATL TY C	(~ 4.23")	0	TONS	*	**$25.00**	/ TON	$0
IMPROVED SUBGRADE:	Aggregate	5,333	SQ YD	*	**$10.00**	/ SQ YD	$53,330
Reserved For User Supplied Item		0	**UNITS**		**$0.00**	/ UNITS	$0
Reserved For User Supplied Item		0	**UNITS**		**$0.00**	/ UNITS	$0
PAVEMENT REMOVAL		5,333	SQ YD		**$0.00**	/ SQ YD	$0
SHOULDER REMOVAL		3,556	SQ YD		**$0.00**	/ SQ YD	$0

Note: * Denotes User Supplied Quantity

RIGID CONSTRUCTION INITIAL COST	$570,000
RIGID CONSTRUCTION ANNUAL COST PER MILE	$122,747

MAINTENANCE COSTS:

ITEM	THICKNESS	MATERIAL	UNIT COST	
ROUTINE MAINTENANCE ACTIVITY			**$0.00**	/ LANE-MILE / YEAR
HMA POLICY OVERLAY	(2.50")			
HMA POLICY OVERLAY PVMT	(2.50")		**$12.50**	/ SQ YD
HMA SURFACE MIX	(1.50")	Surface Mix	**$7.50**	/ SQ YD
HMA BINDER MIX	(1.00")	aling Binder Mix	**$5.00**	/ SQ YD
HMA POLICY OVERLAY SHLD	(2.50")	Shoulder Mix	**$12.50**	/ SQ YD
CLASS A PAVEMENT PATCHING			**$170.00**	/ SQ YD
CLASS B PAVEMENT PATCHING			**$130.00**	/ SQ YD
CLASS C SHOULDER PATCHING			**$110.00**	/ SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA Surf)		Surface Mix	**$88.17**	/ SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA 2.50")		Surface Mix	**$93.49**	/ SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL			**$2.00**	/ LIN FT
CENTERLINE JOINT ROUT & SEAL			**$2.00**	/ LIN FT
REFLECTIVE TRANSVERSE CRACK ROUT & SEAL			**$2.00**	/ LIN FT
RANDOM CRACK ROUT & SEAL	(100% Rehab = 100.00' / Station / Lane)		**$2.00**	/ LIN FT

RIGID TOTAL LIFE-CYCLE COST	$672,960
RIGID TOTAL ANNUAL COST PER MILE	$144,919

MAINTENANCE AND REHABILITATION ACTIVITY SCHEDULE 11/07/13

JOINTED PLAIN CONCRETE PAVEMENT
UNBONDED JOINTED PLAIN CONCRETE OVERLAY
Figure 54-7.A

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST		COST	PRESENT WORTH
YEAR 10								
	PAVEMENT PATCH CLASS B	0.10%	5	SQ YD	$130.00		$650	
	PWFn =	0.7441		PW =	0.7441	X	$650	$484
YEAR 15								
	PAVEMENT PATCH CLASS B	0.20%	11	SQ YD	$130.00		$1,430	
	PWFn =	0.6419		PW =	0.6419	X	$1,430	$918
YEAR 20								
	PAVEMENT PATCH CLASS B	2.00%	107	SQ YD	$130.00		$13,910	
	SHOULDER PATCH CLASS C	0.50%	18	SQ YD	$110.00		$1,980	
	LONGITUDINAL SHLD JT R&S	100.00%	4,000	LIN FT	$2.00		$8,000	
	CENTERLINE JT R&S	100.00%	2,000	LIN FT	$2.00		$4,000	
	PWFn =	0.5537		PW =	0.5537	X	$27,890	$15,442
YEAR 25								
	PAVEMENT PATCH CLASS B	3.00%	160	SQ YD	$130.00		$20,800	
	SHOULDER PATCH CLASS C	1.00%	36	SQ YD	$110.00		$3,960	
	PWFn =	0.4776		PW =	0.4776	X	$24,760	$11,826
YEAR 30	NON-INTERSTATE							
	PAVEMENT PATCH CLASS B	4.00%	213	SQ YD	$130.00		$27,690	
	SHOULDER PATCH CLASS C	1.50%	53	SQ YD	$110.00		$5,830	
	HMA POLICY OVERLAY 2.5" (PVMT)	100.00%	5,333	SQ YD	$12.50		$66,667	
	HMA POLICY OVERLAY 2.5" (SHLD)	100.00%	3,556	SQ YD	$12.50		$44,445	
	PWFn =	0.4120		PW =	0.4120	X	$144,632	$59,586
YEAR 35	NON-INTERSTATE							
	LONGITUDINAL SHLD JT R&S	100.00%	4,000	LIN FT	$2.00		$8,000	
	CENTERLINE JT R&S	100.00%	2,000	LIN FT	$2.00		$4,000	
	RANDOM CRACK R&S	50.00%	2,000	LIN FT	$2.00		$4,000	
	REFLECTIVE TRANSVERSE CRACK R&S	40.00%	1,286	LIN FT	$2.00		$2,572	
	PD PVMT PATCH M&F HMA 2.50"	0.10%	5	SQ YD	$93.49		$467	
	PWFn =	0.3554		PW =	0.3554	X	$19,039	$6,766
YEAR 40	NON-INTERSTATE							
	PAVEMENT PATCH CLASS B	0.50%	27	SQ YD	$130.00		$3,510	
	LONGITUDINAL SHLD JT R&S	100.00%	4,000	LIN FT	$2.00		$8,000	
	CENTERLINE JT R&S	100.00%	2,000	LIN FT	$2.00		$4,000	
	REFLECTIVE TRANSVERSE CRACK R&S	60.00%	1,930	LIN FT	$2.00		$3,860	
	RANDOM CRACK R&S	50.00%	2,000	LIN FT	$2.00		$4,000	
	PD PVMT PATCH M&F HMA 2.50"	0.50%	27	SQ YD	$93.49		$2,524	
	PWFn =	0.3066		PW =	0.3066	X	$25,894	$7,938
								$102,960
	ROUTINE MAINTENANCE ACTIVITY		0.76	Lane Miles	$0.00		$0	$0
					MAINTENANCE LIFE-CYCLE COST			$102,960
45	YEAR LIFE CYCLE	CRFn = 0.0407852			MAINTENANCE ANNUAL COST PER MILE			$22,172

LIFE-CYCLE COST ANALYSIS: NEW DESIGN

Calculated / Revised : **10/4/12 3:26 PM**

			JPCP	HMA
CONSTRUCTION	INITIAL COST	PRESENT WORTH	$570,000	$528,484
		ANNUAL COST PER MILE	$122,747	$113,807
MAINTENANCE	LIFE-CYCLE COST	PRESENT WORTH	$102,960	$188,768
		ANNUAL COST PER MILE	$22,172	$40,650
TOTAL	LIFE-CYCLE COST	PRESENT WORTH	$672,960	$717,252
		ANNUAL COST PER MILE	$144,919	$154,457

LIFE-CYCLE COST ANALYSIS: FINAL SUMMARY

LOWEST COST OPTION	==========>	**JPCP**	**$144,919**	
OTHER OPTIONS (LOWEST TO HIGHEST):	TYPE / PERCENTAGE	**HMA**	**$154,457**	6.6%

P:\Pavement Design Stuff\D-1\US 45 from IL 60 to IL 22 06-18-13\4- US 45 and Butterfield Road\[US 45 at Butterfield Road IDOT Mechanistic Pavement Design w

BDE 5401 Template (Rev. 10/05/2012)

IDOT MECHANISTIC PAVEMENT DESIGN

Printed: 11/07/2013

PROJECT AND TRAFFIC INPUTS

(Enter Data in Gray Shaded Cells)

Route: IL Route 21
Section: 49-Y
County: Lake
Location: River Grove Lane to US45
Facility Type: Other Marked State Route
# of Lanes = 4
Road Class: I
Subgrade Support Rating (SSR): Poor
Construction Year: 2013
Design Period (DP) = 20 years

Comments:
Design Date: 05/14/2013 <-- BY
Modify Date: 05/14/2013 <-- BY

	ADT	Year
Current:	37,100	2002
Future:	43,200	2030

	Minimum ADT	Structural Design Traffic: Actual ADT	Actual %of Total ADT	% of ADT in Design Lane
PV =	0	40,029	96.1%	P = 32%
SU =	250	788	1.9%	S = 45%
MU =	750	859	2.1%	M = 45%
Struct. Design ADT =		41,675	(2023)	

TRAFFIC FACTOR CALCULATION

FLEXIBLE PAVEMENT			RIGID PAVEMENT		
Cpv =	0.15		Cpv =	0.15	
Csu =	132.5		Csu =	143.81	
Cmu =	482.53		Cmu =	696.42	
TF flexible (Actual) =	4.71	(Actual ADT)	TF rigid (Actual) =	6.44	(Actual ADT)
TF flexible (Min) =	3.56	(Min ADT Fig. 54-2.C)	TF rigid (Min) =	5.02	(Min ADT Fig. 54-2.C)

NEW CONSTRUCTION / RECONSTRUCTION PAVEMENT DESIGN CALCULATIONS

Full-Depth HMA Pavement

Use TF flexible = 4.71
PG Grade Lower Binder Lifts = PG 64-22 (Fig. 53-4.R)
Goto Map
HMA Mixture Temp. = 73.0 deg. F (Fig. 54-5.C)
Design HMA Mixture Modulus (E_{HMA}) = 760 ksi (Fig. 54-5.D)
Design HMA Strain (ε_{HMA}) = 77 (Fig. 54-5.E)
Goto Map
Full Depth HMA Design Thickness = 10.25 in. (Fig. 54-5.F)
Limiting Strain Criterion Thickness = 14.25 in. (Fig. 54-5.I)

Use Full-Depth HMA Thickness = 10.25 inches

JPC Pavement

Use TF rigid = 6.44
Edge Support = Tied Shoulder or C.&G.

Rigid Pavt Thick. = 9.25 in. (Fig. 54-4.E)

CRC Pavement

Use TF rigid = 6.44
IBR value = 2

CRCP Thickness = 8.50 in. (Fig. 54-4.M)

TF MUST BE > 60 FOR CRCP

RECONSTRUCTION ONLY (SUPPLEMENTAL) PAVEMENT DESIGN CALCULATIONS

HMA Overlay of Rubblized PCC

Use TF flexible = 4.71
District = 3,4,5,6

HMA Overlay Design Thickness = 8.75 in. (Fig. 54-5.U)

Unbonded Concrete Overlay

Review 54-4.03 for limitations and special considerations.

JPCP Thickness = NA inches

CONTACT BMPR FOR ASSISTANCE

DESIGN TABLES FROM BDE MANUAL CHAPTER 54 - PAVEMENT DESIGN

Class I Roads	Class II Roads	Class III Roads	Class IV Roads
4 lanes or more Part of a future 4 lanes or more One-way Streets with ADT > 3500	2 lanes with ADT > 2000 One way Street with ADT <= 3500	2 Lanes (ADT 750 -2000)	2 Lanes (ADT < 750)

Facility Type	Min. Str. Design Traffic (Fig 54-2.C) PV	SU	MU
Interstate or Supplemental Freeway	0	500	1500
Other Marked State Route	0	250	750
Unmarked State Route	No Min	No Min	No Min

Class Table for One-Way Streets	
ADT	Class
0 - 3500	II
>3501	I

Class	Traffic Factor ESAL Coefficients: Rigid (Fig. 54-4.C) Csu	Cmu	Flexible (Fig. 54-5.B) Csu	Cmu
I	143.81	696.42	132.50	482.53
II	135.78	567.21	112.06	385.44
III	129.58	562.47	109.14	384.35
IV	129.58	562.47	109.14	384.35

Class Table for 2 or 3 lanes (not future 4 lane & not one-way street)	
ADT	Class
0 - 749	IV
750 - 2000	III
>2000	II

Number of Lanes	Design Lane Distribution Factors For Structural Design Traffic (Fig. 54-2.B): Rural P	S	M	Urban P	S	M
1 Lane Ramp	100%	100%	100%	100%	100%	100%
2 or 3	50%	50%	50%	50%	50%	50%
4	32%	45%	45%	32%	45%	45%
6 or more	20%	40%	40%	8%	37%	37%

BDE 5401 Template (Rev. 10/05/2012) Printed: 11/07/2013

LIFE-CYCLE COST ANALYSIS: NEW CONSTRUCTION / RECONSTRUCTION

FULL-DEPTH HMA PAVEMENT

Standard Design

ROUTE	IL Route 21
SECTION	49-Y
COUNTY	Lake
LOCATION	River Grove Lane to US45
FACILITY TYPE	INTERSTATE

PROJECT LENGTH			2640	FT ==>	0.50 Miles
# OF CENTERLINES			1	CL	
# OF LANES			4	LANES	
# OF EDGES			2	EP	
LANE WIDTH - AVERAGE			12	FT	
SHOULDER WIDTH	HMA	Inside	0	FT	
	HMA	Outside	0	FT	

PAVEMENT THICKNESS (FLEXIBLE)	11.00	IN	14.25 IN MAX
SHOULDER THICKNESS	8.00	IN	Standard Design
POLICY OVERLAY THICKNESS	3.75	IN	

FLEX PAVEMENT TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
	7.11	2.68	7.11

Read Me!

HMA COST PER TON	UNIT PRICE
HMA SURFACE	$95.00 / TON
HMA TOP BINDER	$90.00 / TON
HMA LOWER BINDER	$85.00 / TON
HMA BINDER (LEVELING)	$95.00 / TON
HMA SHOULDER	$85.00 / TON

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT		UNIT PRICE	COST
HMA PAVEMENT (FULL-DEPTH)	(11.00")	14,080	SQ YD		$55.12 / SQ YD	$776,099 ~
HMA SURFACE COURSE	(2.00")	14,080	SQ YD	*	$10.22 / SQ YD	$0
HMA TOP BINDER COURSE	(2.25")	14,080	SQ YD	*	$9.73 / SQ YD	$0
HMA LOWER BINDER COURSE	(6.75")	14,080	SQ YD	*	$24.36 / SQ YD	$0
HMA SHOULDER	(8.00")	0	SQ YD	*	$41.73 / SQ YD	$0 ~
CURB & GUTTER		0	LIN FT		$30.00 / LIN FT	$0
SUBBASE GRAN MATL TY C (TONS)		44	TONS		$25.00 / TON	$1,100
IMPROVED SUBGRADE:	Aggregate	5,333	SQ YD	*	$10.00 / SQ YD	$53,330
Reserved For User Supplied Item		0	UNITS		$0.00 / UNITS	$0
Reserved For User Supplied Item		0	UNITS		$0.00 / UNITS	$0
PAVEMENT REMOVAL		14,080	SQ YD		$0.00 / SQ YD	$0
SHOULDER REMOVAL		0	SQ YD		$0.00 / SQ YD	$0

Note: * Denotes User Supplied Quantity

FLEXIBLE CONSTRUCTION INITIAL COST	$830,529
FLEXIBLE CONSTRUCTION ANNUAL COST PER MILE	$67,747

MAINTENANCE COSTS:

ITEM		THICKNESS	MATERIAL	T	UNIT COST
ROUTINE MAINTENANCE ACTIVITY					$0.00 LANE-MILE / YEAR
HMA OVERLAY PVMT SURF		(2.00")	Surface Mix	2.00	$10.22 / SQ YD
HMA OVERLAY PVMT		(3.75")		3.75	$19.16 / SQ YD
HMA SURFACE MIX		(1.50")	Surface Mix	1.50	$8.94 / SQ YD
HMA BINDER MIX		(2.25")	Top Binder Mix	2.25	$10.22 / SQ YD
HMA OVERLAY SHLD	(Year 30)	(1.75")	Shoulder Mix	1.75	$8.94 / SQ YD
HMA OVERLAY SHLD		(2.00")	Shoulder Mix	2.00	$10.22 / SQ YD
MILLING (2.00 IN)				2.00	$2.50 / SQ YD
PARTIAL DEPTH PVMT PATCH		(Mill & Fill Surf)	Surface Mix	2.00	$90.83 / SQ YD
PARTIAL DEPTH SHLD PATCH		(Mill & Fill Surf)	Shoulder Mix	2.00	$89.71 / SQ YD
PARTIAL DEPTH PVMT PATCH		(Mill & Fill +2.00 ")	Leveling Binder Mix	2.00	$90.83 / SQ YD
PARTIAL DEPTH SHLD PATCH		(Mill & Fill +2.00 ")	Shoulder Mix	2.00	$89.71 / SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL					$2.00 / LIN FT
CENTERLINE JOINT ROUT & SEAL					$2.00 / LIN FT
RANDOM / THERMAL CRACK ROUT & SEAL		(100% Rehab = 110.00' / Station / Lane)			$2.00 / LIN FT

FLEXIBLE TOTAL LIFE-CYCLE COST	$1,192,491
FLEXIBLE TOTAL ANNUAL COST PER MILE	$97,272

MAINTENANCE AND REHABILITATION ACTIVITY SCHEDULE 11/07/13

FULL-DEPTH HMA PAVEMENT
HMA OVERLAY OF RUBBLIZED PCC PAVEMENT
Figure 54-7.C
STANDARD DESIGN

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST		COST	PRESENT WORTH
YEAR 5								
	LONG SHLD JT R&S	100.00%	5,280	LIN FT	$2.00		$10,560	
	CNTR LINE JOINT R&S	100.00%	2,640	LIN FT	$2.00		$5,280	
	RNDM / THRM CRACK R&S	50.00%	5,808	LIN FT	$2.00		$11,616	
	PD PVMT PATCH M&F SURF	0.10%	14	SQ YD	$90.83		$1,272	
	PWFn =	0.8626		PW =	0.8626	X	$28,728	$24,781
YEAR 10								
	LONG SHLD JT R&S	100.00%	5,280	LIN FT	$2.00		$10,560	
	CNTR LINE JOINT R&S	100.00%	2,640	LIN FT	$2.00		$5,280	
	RNDM / THRM CRACK R&S	50.00%	5,808	LIN FT	$2.00		$11,616	
	PD PVMT PATCH M&F SURF	0.50%	70	SQ YD	$90.83		$6,358	
	PWFn =	0.7441		PW =	0.7441	X	$33,814	$25,161
YEAR 15								
	MILL PVMT & SHLD 2.00"	100.00%	14,080	SQ YD	$2.50		$35,200	
	PD PVMT PATCH M&F ADD'L 2.00"	1.00%	141	SQ YD	$90.83		$12,807	
	HMA OVERLAY PVMT 2.00"	100.00%	14,080	SQ YD	$10.22		$143,898	
	HMA OVERLAY SHLD 2.00 "	100.00%	0	SQ YD	$10.22		$0	
	PWFn =	0.6419		PW =	0.6419	X	$191,905	$123,177
YEAR 20								
	LONG SHLD JT R&S	100.00%	5,280	LIN FT	$2.00		$10,560	
	CNTR LINE JOINT R&S	100.00%	2,640	LIN FT	$2.00		$5,280	
	RNDM / THRM CRACK R&S	50.00%	5,808	LIN FT	$2.00		$11,616	
	PD PVMT PATCH M&F SURF	0.10%	14	SQ YD	$90.83		$1,272	
	PWFn =	0.5537		PW =	0.5537	X	$28,728	$15,906
YEAR 25								
	LONG SHLD JT R&S	100.00%	5,280	LIN FT	$2.00		$10,560	
	CNTR LINE JOINT R&S	100.00%	2,640	LIN FT	$2.00		$5,280	
	RNDM / THRM CRACK R&S	50.00%	5,808	LIN FT	$2.00		$11,616	
	PD PVMT PATCH M&F SURF	0.50%	70	SQ YD	$90.83		$6,358	
	PWFn =	0.4776		PW =	0.4776	X	$33,814	$16,150
	HMA_SD							
YEAR 30	INTERSTATE							
	MILL PVMT ONLY 2.00"	100.00%	14,080	SQ YD	$2.50		$35,200	
	PD PVMT PATCH M&F ADD'L 2.00"	2.00%	282	SQ YD	$90.83		$25,614	
	PD SHLD PATCH M&F SURF 2.00"	1.00%	0	SQ YD	$89.71		$0	
	HMA OVERLAY PVMT 3.75 "	100.00%	14,080	SQ YD	$19.16		$269,808	
	HMA OVERLAY SHLD 1.75 "	100.00%	0	SQ YD	$8.94		$0	
	PWFn =	0.4120		PW =	0.4120	X	$330,622	$136,212
YEAR 35								
	LONG SHLD JT R&S	100.00%	5,280	LIN FT	$2.00		$10,560	
	CNTR LINE JOINT R&S	100.00%	2,640	LIN FT	$2.00		$5,280	
	RNDM / THRM CRACK R&S	50.00%	5,808	LIN FT	$2.00		$11,616	
	PD PVMT PATCH M&F SURF	0.10%	14	SQ YD	$90.83		$1,272	
	PWFn =	0.3554		PW =	0.3554	X	$28,728	$10,209
YEAR 40								
	LONG SHLD JT R&S	100.00%	5,280	LIN FT	$2.00		$10,560	
	CNTR LINE JOINT R&S	100.00%	2,640	LIN FT	$2.00		$5,280	
	RNDM / THRM CRACK R&S	50.00%	5,808	LIN FT	$2.00		$11,616	
	PD PVMT PATCH M&F SURF	0.50%	70	SQ YD	$90.83		$6,358	
	PWFn =	0.3066		PW =	0.3066	X	$33,814	$10,366
								$361,962
	ROUTINE MAINTENANCE ACTIVITY		2.00	Lane Miles	0.00		$0	$0
					MAINTENANCE LIFE-CYCLE COST			$361,962
45	YEAR LIFE CYCLE	CRFn = 0.0407852			MAINTENANCE ANNUAL COST PER MILE			$29,525

PCC PAVEMENT

JPCP

ROUTE			IL Route 21		
SECTION			49-Y		
COUNTY			Lake		
LOCATION			River Grove Lane to US45		
FACILITY TYPE			INTERSTATE		
PROJECT LENGTH			2640 FT	= = >	0.50 Miles
# OF CENTERLINES			1 CL		
# OF LANES			4 LANES		
# OF EDGES			2 EP		
LANE WIDTH - AVERAGE			12 FT		
SHOULDER WIDTH	PCC	Inside	0 FT		
	PCC	Outside	0 FT		

PAVEMENT THICKNESS (RIGID)	JPCP	10.00 IN	TIED SHLD
SHOULDER THICKNESS		10.00 IN	
POLICY OVERLAY THICKNESS		3.75 IN	

RIGID PAVEMENT TRAFFIC FACTORS		MINIMUM	ACTUAL	USE
		10.05	3.51	10.05
Worksheet Construction Type is	New Construction		The Pavement Type is	JPCP

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT		UNIT PRICE		COST
JPC PAVEMENT	(10.00")	14,080	SQ YD		$40.73	/ SQ YD	$573,478
PAVEMENT REINFORCEMENT		0	SQ YD		$0.00	/ SQ YD	$0
STABILIZED SUBBASE	(4.50")	14,960	SQ YD		$0.00	/ SQ YD	$0
PCC SHOULDERS	(10.00" to 10.00")	0	SQ YD		$35.73	/ SQ YD	$0
CURB & GUTTER		0	LIN FT		$30.00	/ LIN FT	$0
SUBBASE GRAN MATL TY C	(~ 0.00")	44	TONS	*	$25.00	/ TON	$1,100
IMPROVED SUBGRADE:	Aggregate	5,333	SQ YD	*	$10.00	/ SQ YD	$53,330
Reserved For User Supplied Item		0	UNITS		$0.00	/ UNITS	$0
Reserved For User Supplied Item		0	UNITS		$0.00	/ UNITS	$0
PAVEMENT REMOVAL		14,080	SQ YD		$0.00	/ SQ YD	$0
SHOULDER REMOVAL		0	SQ YD		$0.00	/ SQ YD	$0

Note: * Denotes User Supplied Quantity

RIGID CONSTRUCTION INITIAL COST	$627,908
RIGID CONSTRUCTION ANNUAL COST PER MILE	$51,219

MAINTENANCE COSTS:

ITEM	THICKNESS	MATERIAL		UNIT COST	
ROUTINE MAINTENANCE ACTIVITY				$0.00	/ LANE-MILE / YEAR
HMA POLICY OVERLAY	(3.75")				
HMA POLICY OVERLAY PVMT	(3.75")			$19.16	/ SQ YD
HMA SURFACE MIX	(1.50")	Surface Mix		$7.67	/ SQ YD
HMA BINDER MIX	(2.25")	Top Binder Mix		$11.50	/ SQ YD
HMA POLICY OVERLAY SHLD	(3.75")	Shoulder Mix		$19.16	/ SQ YD
CLASS A PAVEMENT PATCHING				$170.00	/ SQ YD
CLASS B PAVEMENT PATCHING				$130.00	/ SQ YD
CLASS C SHOULDER PATCHING				$110.00	/ SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA Surf)		Surface Mix		$88.17	/ SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA 1.50")		Surface Mix		$88.17	/ SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL				$2.00	/ LIN FT
CENTERLINE JOINT ROUT & SEAL				$2.00	/ LIN FT
REFLECTIVE TRANSVERSE CRACK ROUT & SEAL				$2.00	/ LIN FT
RANDOM CRACK ROUT & SEAL	(100% Rehab = 100.00' / Station / Lane)			$2.00	/ LIN FT

RIGID TOTAL LIFE-CYCLE COST	$856,283
RIGID TOTAL ANNUAL COST PER MILE	$69,847

MAINTENANCE AND REHABILITATION ACTIVITY SCHEDULE 11/07/13

JOINTED PLAIN CONCRETE PAVEMENT
UNBONDED JOINTED PLAIN CONCRETE OVERLAY
Figure 54-7.A

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST		COST	PRESENT WORTH
YEAR 10								
	PAVEMENT PATCH CLASS B	0.10%	14	SQ YD	$130.00		$1,820	
	PWFn =	0.7441		PW =	0.7441	X	$1,820	$1,354
YEAR 15								
	PAVEMENT PATCH CLASS B	0.20%	28	SQ YD	$130.00		$3,640	
	PWFn =	0.6419		PW =	0.6419	X	$3,640	$2,336
YEAR 20								
	PAVEMENT PATCH CLASS B	2.00%	282	SQ YD	$130.00		$36,660	
	SHOULDER PATCH CLASS C	0.50%	0	SQ YD	$110.00		$0	
	LONGITUDINAL SHLD JT R&S	100.00%	5,280	LIN FT	$2.00		$10,560	
	CENTERLINE JT R&S	100.00%	2,640	LIN FT	$2.00		$5,280	
	PWFn =	0.5537		PW =	0.5537	X	$52,500	$29,068
YEAR 25								
	PAVEMENT PATCH CLASS B	3.00%	422	SQ YD	$130.00		$54,860	
	SHOULDER PATCH CLASS C	1.00%	0	SQ YD	$110.00		$0	
	PWFn =	0.4776		PW =	0.4776	X	$54,860	$26,201
YEAR 30	INTERSTATE							
	PAVEMENT PATCH CLASS B	4.00%	563	SQ YD	$130.00		$73,190	
	SHOULDER PATCH CLASS C	1.50%	0	SQ YD	$110.00		$0	
	HMA POLICY OVERLAY 3.75" (PVMT)	100.00%	14,080	SQ YD	$19.16		$269,808	
	HMA POLICY OVERLAY 3.75" (SHLD)	100.00%	0	SQ YD	$19.16		$0	
	PWFn =	0.4120		PW =	0.4120	X	$342,998	$141,311
YEAR 35	INTERSTATE							
	LONGITUDINAL SHLD JT R&S	100.00%	5,280	LIN FT	$2.00		$10,560	
	CENTERLINE JT R&S	100.00%	2,640	LIN FT	$2.00		$5,280	
	RANDOM CRACK R&S	50.00%	5,280	LIN FT	$2.00		$10,560	
	REFLECTIVE TRANSVERSE CRACK R&S	40.00%	3,379	LIN FT	$2.00		$6,758	
	PD PVMT PATCH M&F HMA SURF 1.50"	0.10%	14	SQ YD	$88.17		$1,234	
	PWFn =	0.3554		PW =	0.3554	X	$34,392	$12,222
YEAR 40	INTERSTATE							
	PAVEMENT PATCH CLASS B	0.50%	70	SQ YD	$130.00		$9,100	
	LONGITUDINAL SHLD JT R&S	100.00%	5,280	LIN FT	$2.00		$10,560	
	CENTERLINE JT R&S	100.00%	2,640	LIN FT	$2.00		$5,280	
	REFLECTIVE TRANSVERSE CRACK R&S	60.00%	5,069	LIN FT	$2.00		$10,138	
	RANDOM CRACK R&S	50.00%	5,280	LIN FT	$2.00		$10,560	
	PD PVMT PATCH M&F HMA SURF 1.50"	0.50%	70	SQ YD	$88.17		$6,172	
	PWFn =	0.3066		PW =	0.3066	X	$51,810	$15,883
								$228,375
	ROUTINE MAINTENANCE ACTIVITY		2.00	Lane Miles	$0.00		$0	$0
					MAINTENANCE LIFE-CYCLE COST			$228,375
45	YEAR LIFE CYCLE	CRFn = 0.0407852			MAINTENANCE ANNUAL COST PER MILE			$18,629

LIFE-CYCLE COST ANALYSIS: NEW DESIGN

Calculated / Revised : **5/23/13 11:02 AM**

			JPCP	HMA
CONSTRUCTION	INITIAL COST	PRESENT WORTH	$627,908	$830,529
		ANNUAL COST PER MILE	$51,219	$67,747
MAINTENANCE	LIFE-CYCLE COST	PRESENT WORTH	$228,375	$361,962
		ANNUAL COST PER MILE	$18,629	$29,525
TOTAL	LIFE-CYCLE COST	PRESENT WORTH	$856,283	$1,192,491
		ANNUAL COST PER MILE	$69,847	$97,272

LIFE-CYCLE COST ANALYSIS: FINAL SUMMARY

LOWEST COST OPTION	==========>	**JPCP**	**$69,847**	
OTHER OPTIONS (LOWEST TO HIGHEST):	TYPE / PERCENTAGE	**HMA**	**$97,272**	**39.3%**

P:\Pavement Design Stuff\D-1\US 45 from IL 60 to IL 22 06-18-13\7- IL 21 from (US45 to Port Clinton Rd)\[IDOT Mechanistic Pavement Design (IL 21 from US45 t